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# BULLETIN OF THE NEW YORK ACADEMY OF MEDICINE

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Vol 13

JANUARY, 1937

No 1

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## A CASE OF PERICARDITIS WITH EFFUSION\*

### Studies of Venous Pressure Changes

J L CATCHER, JR

The case presented here was studied in the medical wards of the Presbyterian Hospital for many weeks. During that time it was not possible to establish beyond doubt a diagnosis, but some studies were done which seem to be of clinical and physiological interest.

The patient was a 53 year old married negro laborer who entered the hospital on December 16, 1935, complaining of cough and shortness of breath of 6 weeks' duration.

The family and marital data were unimportant. He had been a persistent user of tobacco in various forms, and until 5 years before had consumed alcoholic fluids frequently, often to excess. His occupation had always been that of laborer, and had consisted of heavy out-of-door work with no exposure to industrial hazards. His average weight had been 155 pounds, and he had noticed no recent change.

His general health had always been excellent. Pneumonia 26 and "flu" 18 years before were the only serious illnesses he had experienced. He had several head colds each winter, but none severe enough to keep him from his work. Eleven years ago he received a razor wound of the abdominal wall large enough to allow some of his intestines to escape from the abdominal cavity. Operative closure was done promptly and he had an uneventful recovery.

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\* From the Department of Medicine, College of Physicians and Surgeons, Columbia University, and the Presbyterian Hospital, New York City.



An insurance examination 5 years before admission, including urinalysis, blood pressure measurement and auscultation of the heart and lungs, showed no abnormalities.

His present illness began rather abruptly 6 weeks before admission when he had a cough productive of thin, white, foamy sputum, and seeming to arise from a tickling sensation under the upper part of the sternum. With this cough he had no sore throat, chest pain, fever, or general malaise, but at this same time he noticed that if he tried to hurry up a flight of stairs he would become short of breath and feel weak. There was no precordial pain, palpitation or edema.

Although the dyspnea increased slowly in severity, he continued his work as a WPA laborer. Two weeks before admission, following exposure to cold, his symptoms became more severe, with cough more frequent and more violent, sputum more profuse, and breathing more difficult. At this time he first noticed a rather dull aching pain under the sternum on exertion, relieved promptly by rest.

His appetite continued to be good, but 10 days before admission he observed that eating even a small amount of food caused a feeling of epigastric fullness. He consulted a physician who said that his liver was swollen and prescribed some medicine. This failed to help him, his symptoms progressed, orthopnea developed, and he came to the hospital for treatment. He had continued working until 3 days before admission.

His temperature was  $101^{\circ}$ , pulse rate 100, respiratory rate 24 and blood pressure 130 systolic, 95 diastolic.

Physical examination showed a thin, acutely ill negro with dyspnea, orthopnea, and paroxysms of coughing during which he raised considerable mucoid sputum. The pupils were normal. The ocular fundi showed only moderate sclerosis. The teeth were carious, the throat and neck negative. There was no glandular enlargement. The respirations were shallow. There were signs of pleural effusion at the left base, numerous moist rales at the right base. The apices were normal. The heart was extremely large, the sounds muffled. The rhythm was regular. The

pulmonic second sound was louder than the aortic and there was a soft systolic murmur at the apex. The radial pulses were of good quality and the vessel walls soft.

The liver extended 6 cm. below the costal margin. The spleen was not palpable. There was no shifting dullness or fluid wave. The genitalia were normal and rectal examination negative. Normal reflexes were elicited. There was moderate edema over the sacrum, only slight edema of the ankles. There was no clubbing or tremor of the fingers.

*Investigation showed*

Urine—normal

Blood Wassermann—negative

Hemoglobin—75 per cent (Sahli)

Red Blood Count—4,270,000

White Blood Count—11,300, with polymorphonuclears 68 per cent

Erythrocyte Sedimentation Rate—47 mm. in 1 hour

Non Protein Nitrogen—46 mg. per cent

Electrocardiogram—sinus rhythm, P—R interval 0.14 second, T<sub>1</sub> isoelectric, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> inverted, and all the T waves of low amplitude.

Portable x-ray of the chest—enormous heart shadow with some pleural fluid at each base, the apices clear.

Vital Capacity—1,200 c.c.

Circulation Time—42 sec. (NaCN—normal 20)

Venous Pressure—262 mm. H<sub>2</sub>O (direct method—normal less than 100)

The diagnostic problem seemed to be a differentiation of acute cardiac dilatation from pericardial effusion. He was given rest, morphine, oxygen, and digitalis, and 400 c.c. of fluid were removed from the left pleural cavity. With this there was some temporary improvement, but on the 5th day after admission his condition became worse, his pulse became "paradoxical", and x-ray showed an alteration in the shape of the heart with a change from the upright to the recumbent position. A paracentesis of the pericardium

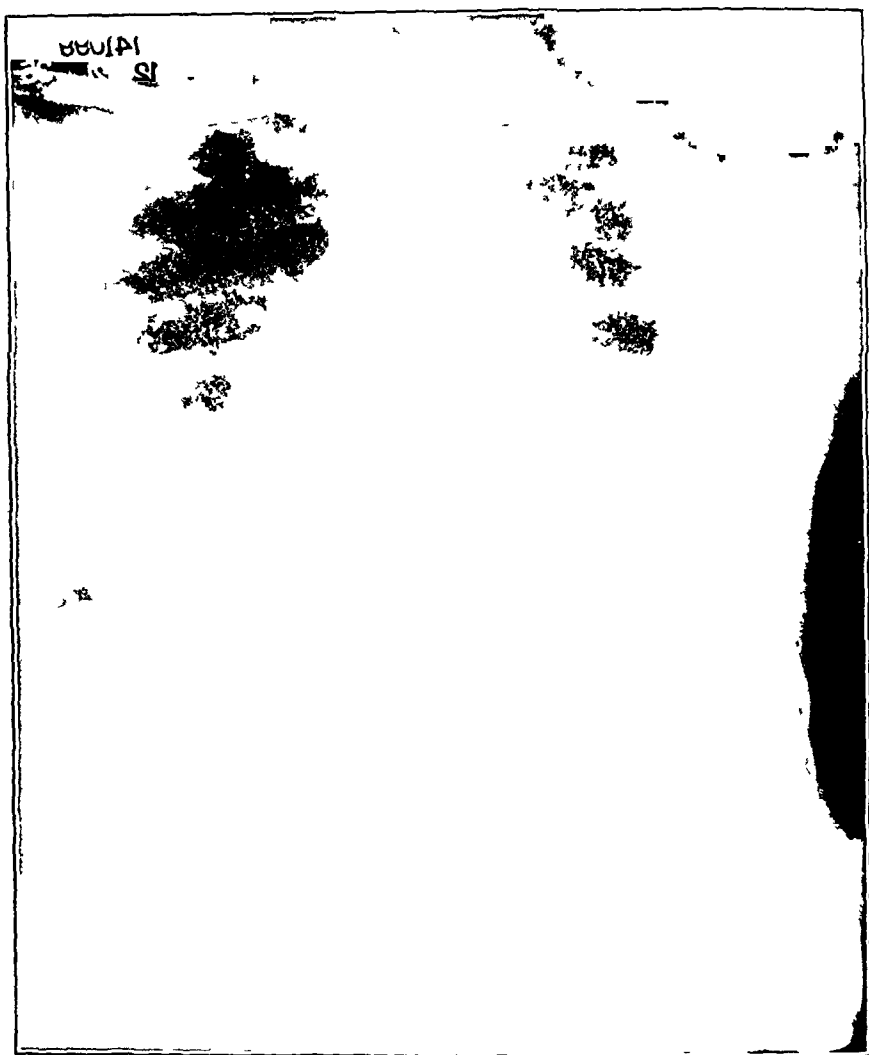


FIG 1 Picture taken 5 days after admission, with patient erect, showing huge heart shadow of the "water bottle" type

was done and 550 c c of bloody fluid—Hgb 21 per cent, R B C 1,000,000—were removed. The patient showed a striking improvement but only temporarily, so that a second pericardial tap was done with the removal of 700 c c of fluid and the injection of 150 c c of air. Following this there was a marked improvement in the patient's condition which continued for several weeks.

During this period in spite of a persistent low grade fever and elevated erythrocyte sedimentation rate, all signs of congestive failure disappeared. However, this improvement was not maintained; his condition became steadily worse and in spite of the fact that there was no evidence of reaccumulation of pericardial fluid, he developed gradually increasing congestion of the bases of the lungs, enlargement of the liver and edema over the sacrum.

Three x-ray pictures have been selected to illustrate the changes in his heart contour:

- (1) On admission (Fig 1) Typical "water bottle" shape
- (2) After injection of air (Fig 2) With patient lying on his side, the thickened pericardium is outlined
- (3) After signs of congestive failure reappeared (Fig 3) There is no evidence of reaccumulation of fluid

This case was selected for presentation because interesting data giving a more or less quantitative measure of the circulatory status were obtained by study of the venous pressure, circulation time and vital capacity during his course.

The first chart (Fig 4) shows the change in the venous pressure during the withdrawal of pericardial fluid. It can be seen readily that the most marked fall in venous pressure occurred with the removal of the first few cubic centimeters of fluid. This illustrates what may be called the "critical effect" which arises during the accumulation of pericardial fluid when the pericardial pressure reaches a height sufficient to embarrass seriously the diastolic filling of the heart.

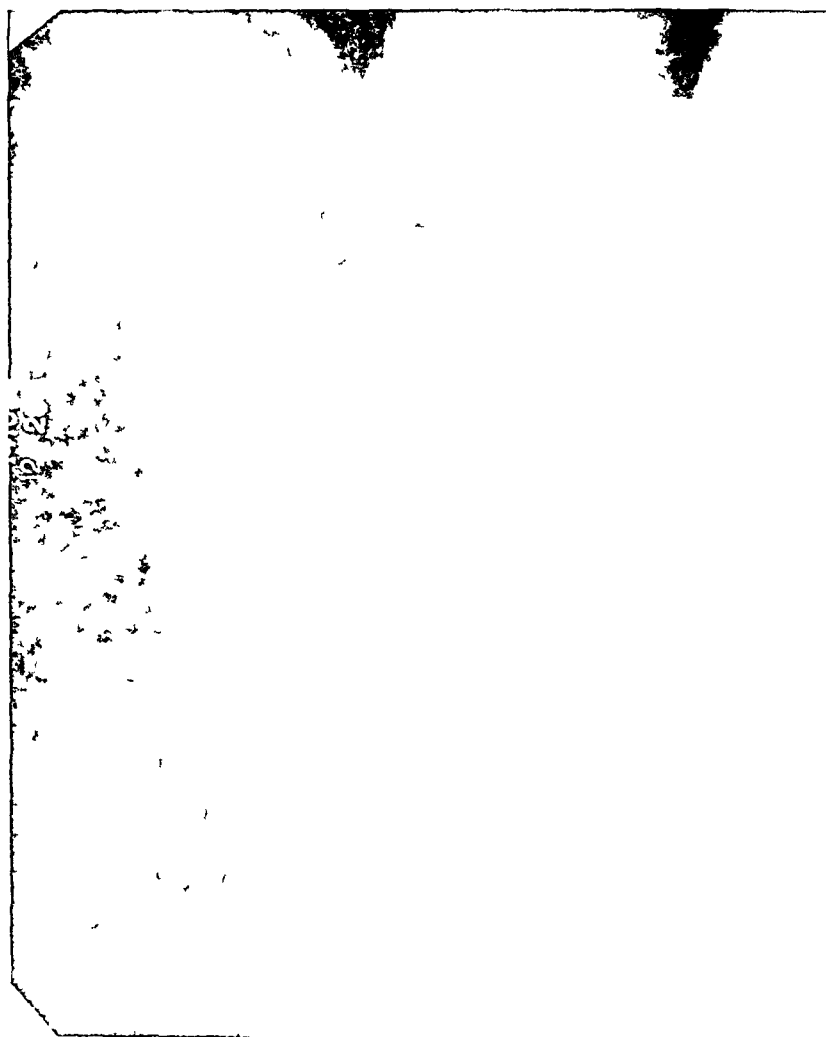


FIG 2 Picture taken 7 days after admission with patient lying on left side following the removal of 700 c c of fluid from the pericardium with replacement of 150 c c of air



FIG 3 Picture taken 3 months after admission, with patient erect, showing no evidence of reaccumulation of pericardial fluid

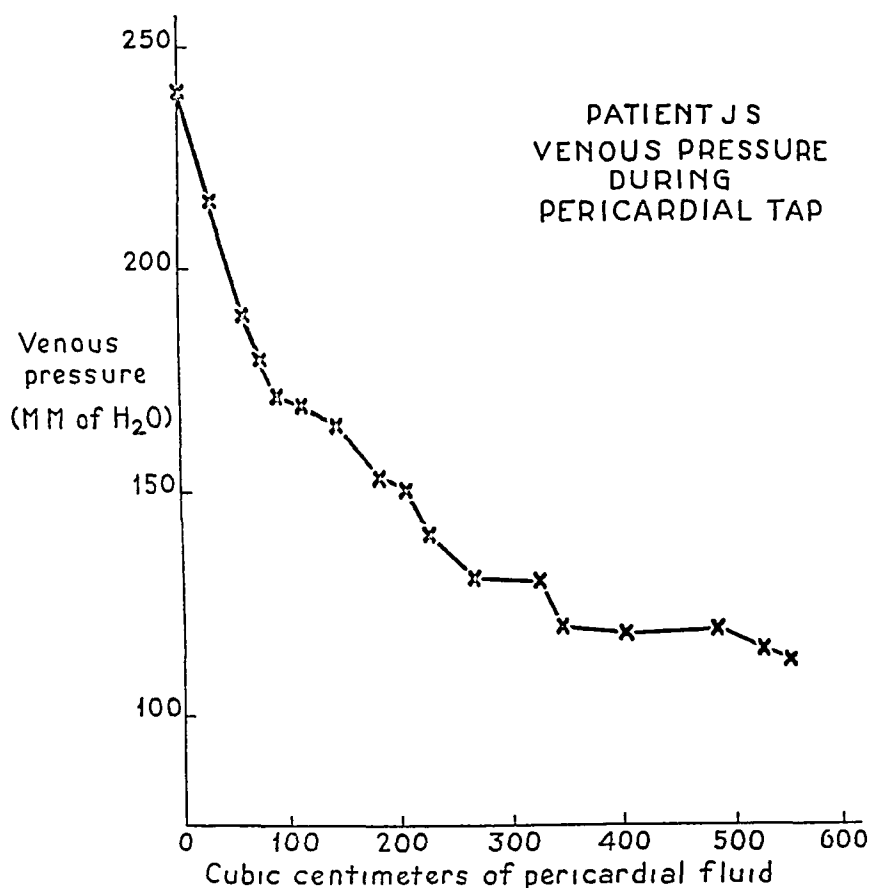


FIG 4 Diagram of venous pressure change during removal of fluid from pericardium, 5 days after admission

During the removal of this fluid the other changes noted were

Increase of vital capacity from 900 to 1400 c c

Increase of arterial pressure from 128/90 to 165/95

Decrease of circulation time from 45 to 21 seconds

The second chart shows the changes in the venous pressure, vital capacity and circulation time during the patient's stay in the hospital. It gives a graphic representation of his improvement during the first few weeks and of the change for the worse later in his course. The vital capacity measurements were discontinued when the pa-

tient's condition became such that he was not able to cooperate well while the circulation time studies were given up because of the severe reaction which the patient began to have to the sodium cyanide

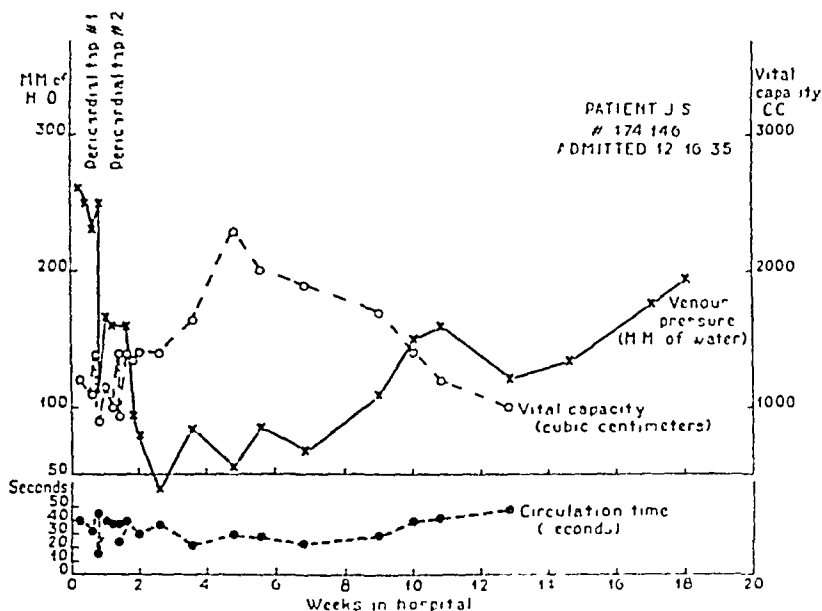


FIG 5 Changes in venous pressure, vital capacity and circulation time, showing early improvement, followed by relapse

In conclusion it may be said that no definite diagnosis was proven clinically. No tubercle bacilli were demonstrated in the sputum, or the pleural or pericardial fluid. He had a persistent, but variable fever and an elevated erythrocyte sedimentation rate and the best interpretation seemed to be that he had had a tuberculous infection of the pericardium with exudation of bloody fluid, which then progressed to the formation of tuberculous granulation tissue in the pericardium, with progressive impairment of the cardiac function.

Because of the persistent evidence of active infection, and because of the patient's extremely poor general condition, surgical treatment of the pericardial adhesions seemed to be definitely contra-indicated.



*Addendum* This patient died on May 25, 1936, six days after the case was presented at the Academy of Medicine. An autopsy was done by Dr. M. N. Richter. The final anatomical diagnoses were Tuberculosis of Pericardium, Miliary Tuberculosis, generalized, and Pulmonary Tuberculosis, right. The pathologist's final note was "A case of tuberculous pericarditis in an elderly colored man. The route of infection can not be traced. There is a terminal miliary dissemination, and somewhat larger areas of caseation at the apex of one lung, and in the prostate, but these have not the appearance of old lesions."

*Reference* W. P. THOMPSON, "Primary Tuberculosis of the Pericardium," *JAMA*, 1933, Vol. 100, p. 642

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### CHANGE IN ADVERTISING POLICY

It is announced that after the expiration of present contracts, advertisements for medical products will be accepted by the Academy Bulletin only when accepted by the Council on Pharmacy and Chemistry or the Council on Physical Therapy of the American Medical Association.

Advertisements for medical products not considered by the councils of the American Medical Association will be accepted only with the approval of the Editorial Board.

Advertisements for non medical products will be accepted if advertisements are in conformity with the type approved by the Editorial Board.



## RECURRENT PERICARDIAL EFFUSION OF UNKNOWN ETIOLOGY

### REPORT OF A CASE WITH STUDIES OF THE CIRCULATION AND OF ABSORPTION FROM THE PERICARDIAL CAVITY\*†

HAROLD J. STEWART, NORMAN I. CRANE and JOHN E. DITTRICK

From the New York Hospital and the Department of Medicine,  
Cornell University Medical College, New York

There has been under our observation for 21 months a patient who has presented an unusual lesion involving the pericardium, namely recurrent chronic pericardial effusion, for the occasion of which we have so far been unable to ascertain or establish the mechanism. We have been unable to find in the literature a situation similar to it and on this account it appeared to be of interest to describe the case. Moreover, the opportunity was afforded us of making certain studies of the circulation.

The function which the pericardium serves has not been clearly defined. The notion is current that its chief function is to prevent rapid dilatation of the heart<sup>1</sup>. Too much emphasis may have been placed on this point. Congenital absence of the pericardium occurs in man and individuals exhibiting this defect have not appeared to have suffered circulatory embarrassment<sup>2, 3</sup>. Moreover, in dogs the pericardium may be excised without giving rise to untoward effects<sup>4</sup>. The pericardium is a none too distensible sac when subjected to acute stretching, but is capable of rather remarkable distensibility when it is put to the test gradually. The lesions to which it is subject give it unusual significance even though its exact function has not yet been defined. The pericardium is subject on the one hand to lesions which give rise to the accumulation of fluid in the pericardial cavity, and on the other hand to lesions leading

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\* An abstract of certain of these observations was read at the Annual Scientific Meeting of the New York Heart Association on April 28, 1936. Transactions of the New York Heart Association, American Heart Journal, 1936, vol 12, p 241.

† This paper is also No. 2 of the series on Studies of the Circulation published from the New York Hospital and the Department of Medicine, Cornell University Medical College.

to the formation of adhesions, which may be external or internal or both. In fact, the first, fluid, may be the forerunner of the second, adhesions. In both situations the function of the enmeshed organ, the heart, may be interfered with seriously. With regard to the former lesion—pericardial effusion—there is point in knowing to what extent it interferes with the circulation, because of the frequency of its occurrence in the course of rheumatic infection, tuberculosis, empyema, as a consequence of other infections involving its surface, uremia, and occasionally congestive heart failure. It may be of sufficient quantity to give rise to cardiac tamponade. Cohnheim<sup>5</sup> described clearly the consequences of acute distention of the pericardium in animals. As a matter of fact, up to the present the information which is available has been derived for the most part from observations made of animals. Patients exhibiting pericardial effusion are too sick in most instances to cooperate in prolonged and detailed observations. Furthermore, neither the mechanism of the formation of pericardial fluid, nor of its absorption, nor the factors controlling its quantity under normal circumstances are precisely known. In short, there is a provocative lack of knowledge pertaining to the pericardium. We have had opportunity in the case of this patient to make certain observations leading to a clearer insight into these mechanisms.

In this paper is recorded a description of this unusual case exhibiting chronic pericardial effusion, together with certain quantitative measurements of the circulation in the presence of cardiac tamponade, as well as certain observations relating to absorption of dyes from the pericardial cavity. A more detailed study of the measurements of the circulation will be made elsewhere.

All observations were made with the patient in a basal metabolic state: rebreathings for the calculation of the arteriovenous oxygen difference, the oxygen consumption, the vital capacity, the circulation time, the venous pressure, the height and weight, the electrocardiogram, the x-ray photograph of the heart, the blood pressure. Measurements

of cardiac output were made by the Grollman method, the three sample technique being employed<sup>6</sup> The estimation of the arm to tongue circulation time was made by the use of decholin<sup>7</sup> The venous pressure was measured by the direct method<sup>8</sup>

E. C., History No 94114 a white female, 14 years of age, was admitted first to the New York Hospital on April 12, 1935, complaining of swelling of the eyelids, cyanosis, dyspnea on exertion, and frequency of micturition of six years duration There was no family history of tuberculosis The past history contained no significant facts

The present illness began in 1928, when the patient was seven and a half years of age At this time swelling of the eyelids and lips appeared At the end of six weeks, during which the patient experienced headache, she was admitted to the New York Nursery and Child's Hospital on October 29, 1928 An abstract of the data at this time discloses these facts There was edema of the face, bilateral hydrothorax, ascites, and enlargement of the liver to the level of the umbilicus The systolic blood pressure measured 100 mm of mercury, the diastolic 75 mm There were no murmurs of the heart The examination of the urine revealed no abnormalities The Wassermann reaction of the blood was negative Tuberculin reaction of the skin was negative The serum proteins amounted to 7.3 gm per cent The fluid removed from the pleural cavity appeared to be a transudate The electrocardiogram showed complexes of low amplitude with a slight tendency to right axis deviation X-ray photograph of the chest confirmed the diagnosis of bilateral pleural effusion and suggested the "presence of pericarditis" As a consequence of the removal of the pleural fluid by paracentesis and the use of diuretics, the patient improved and was discharged from the hospital

She was readmitted to the same hospital in February, 1931 because of recurrence of symptoms Again, after treatment by measures similar to those used before, she improved sufficiently to be discharged After that time she was seen at irregular intervals In 1933 the patient observed cyanosis of the hands and feet Because of the

reappearance of ascites, admission to New York Hospital was recommended, and she was admitted suffering from the complaints already recorded

Examination at this time revealed an under nourished, under developed girl, who looked younger than her stated age of 14 years. As a matter of fact she was approximately the size of the average child of 8 years. Her mental development had not been retarded. The combination of these two factors—undersize and normal mental capacity—gave the child a semblance of precocity. There was cyanosis of the lips and nail beds. The face was puffy. The retinal vessels were engorged. The heart rate was rapid, the pulse of small volume. The superficial veins were distended, especially those of the neck. In fact, the venous pressure measured 135 mm. of saline (normal usually less than 100 mm. by this method). The systolic blood pressure measured 120 mm. of mercury, the diastolic 80 mm. There were signs of a moderate amount of fluid in the left pleural cavity. The percussion of the heart showed it enlarged both to the right and to the left. There were no murmurs of the heart. The heart sounds were moderately loud. The fluoroscopic examination of the heart revealed a large cardiac silhouette having almost no visible pulsation. The configuration of the shadow was compatible with the diagnosis of pericardial effusion. There were signs of fluid in the peritoneal cavity. After removal of 1900 c c of greenish yellow ascitic fluid (April 13, 1935) the liver was found to be enlarged. Tap of the pericardium having been decided upon, 1100 c c of yellowish green fluid was removed. After its removal the cardiac shadow in the x-ray photograph was smaller, but remained large, still. The hilar markings were increased, and the lung markings were accentuated. The patient's condition improved following the pericardial tap. It may be stated at this time that guinea pigs inoculated with pericardial fluid on two occasions and ascitic fluid on one occasion did not develop tuberculous lesions. Tuberculin skin test at this time as well as on another occasion was negative. She was given ammonium chloride and

salyigan and theocalcin with moderate diuretic effect. Having lost 3 kgm in weight, she was discharged on May 6, 1935. During this admission the count of the red blood cells was 4,700,000, of the white blood cells 11,600. The hemoglobin amounted to 95 per cent (Sahli) on a basis of 14.5 grams being equivalent to 100 per cent. The serum proteins amounted to 6.0 grams per cent. The examination of the urine was essentially negative. In the concentration test the specific gravity of the urine rose to 1.027. She excreted 45 per cent of the phenolsulphonephthalein in 45 minutes, and 75 per cent of it in two hours. The electrocardiogram showed complexes of low voltage (Fig. 3).

It was suspected at this time that the patient's symptoms and signs were due to an accumulation of fluid in the pericardial cavity, in short, that pleural effusion, ascites, enlargement of the liver, edema of the face, distention of the neck veins, elevation of venous pressure, occurred as a consequence of cardiac tamponade, a notion that was confirmed later. The etiology of the pericardial lesion was, however, not known.

The patient was readmitted May 23, 1935 because of recurrence of cyanosis, edema of face and now of legs, orthopnea, ascites and pleural effusion. On this occasion 600 cc of fluid was removed from the pericardial cavity (2nd tap) on May 25, 1935. The patient was relieved of her symptoms by this measure and the signs of the other accumulations of fluid (pleural and abdominal) decreased. Giving salyigan resulted in diuresis of 1930 cc at a time when the fluid intake was 1050 cc. There was gradual recurrence of pericardial fluid with the signs and symptoms of tamponade again appearing. Experience showed that pericardial tap was required at approximately four week intervals, and was followed on each occasion by relief of the symptoms. From the time of the first tap, April 24, 1935 to November 5, 1935 (7 months) 7 taps were necessary. The amount removed varied between 500 cc and 1500 cc, but it was in most instances greater than 1000 cc.

During this time (7 months) we had the opportunity of making many observations of the circulation before and

after removal of fluid by pericardial tap (see observation and discussion) X-ray and fluoroscopic examinations after removal of fluid did not reveal calcification of the pericardium. It was found that the administration of theocalcin and salyrgan or mercupurin delayed the recurrence of secondary consequences of venous obstruction, ascites and pleural effusion. Observation on many occasions allow us to make these generalities. Following tap, the relief of the patient's symptoms was striking: dyspnea, cyanosis and distention of neck veins diminished at once, the next day the face was no longer swollen and ascites and pleural effusion decreased. Improvement continued for a week or ten days, when the patient then observed a gradual recurrence of symptoms, increasing in severity until pericardial tap was again necessary. It was apparent that the patient was suffering from a pericardial lesion giving rise to recurrent effusion. Since it did not appear to be tuberculous in its nature, and organic lesion of the heart could not be detected, and there was no evidence of rheumatic infection, the nature of the lesion was a matter of speculation only.

That there might be pericardial adhesions giving rise to multiple loculations, or to mechanical obstruction appeared to be a possibility. Because pericardial taps were required at shorter intervals an exploratory operation was decided upon at the time of the seventh admission in November, 1935. This decision having been made, pericardial tap was done. In an interval when the patient was at her best she was transferred to the Surgical Service and operated on by Dr. George J. Heuer on November 15, 1935, under ether and oxygen anesthesia.

**Operation.** Exposure of the pericardium was made by removal of the third and sixth costal cartilages. The pericardium was exposed over an area 6 cm. square. Outwardly it appeared normal. There were no external adhesions. The pericardium was incised and 800 c. c. of fluid removed slowly. The patient suffered no untoward effects as a consequence of release of the intrapericardial pressure. The sac was then opened more widely. The heart was not

enlarged. There was a fibrous exudate covering it. There were no adhesions between the visceral and parietal pericardium and no bands which could have caused obstruction were detected. The heart was freely movable. There did not appear to be obstruction about the superior or the inferior vena cava. The parietal surface was smooth and glistening. Tubercles were not present. A strip of pericardium was removed for microscopic examination and in sewing up the layers, the pericardial edges were not approximated but the cavity was left open to the mediastinum. Following operation there was rise in temperature,  $38.6^{\circ}\text{C}$  (mouth), but this fell to normal in six days. When accumulation of fluid in the left chest and pericardial cavity occurred rapidly the output of urine was increased by giving mercupurin every three days. She began sitting up on November 29, 1935. Removal of 1400 c c of pericardial fluid was required on December 5, 1935 (8th tap). She was discharged December 8, 1935, to be followed in the Cardiac Clinic. The ninth tap was required on December 17, 1935, and from that time until November 19, 1936, seventeen taps have been necessary. The total number of taps was twenty-three from the time of the first, April 27, 1935, to November 19, 1936. The amount of fluid has varied between 600 c c and 1800 c c. On each occasion the pulse was paradoxical in type when fluid was present and lost this characteristic after its removal. During this time the patient's regime has been as follows. She takes a diet which has low salt and high protein content. The daily fluid intake is limited to 1200 c c. Between pericardial taps the patient is given 1.0 to 2.0 c c mercupurin intravenously at 7 to 10 day intervals. The patient's general condition has remained unchanged. Menses have not yet started. The height has increased from 139.5 cm (April, 1935) to 143.0 cm (November, 1936) in 21 months. Her weight when she was free of fluid in April, 1935 was 27.8 kgm and it was, in November, 1936, 29.0 kgm at a comparable time in her state of well-being. There has been no rise in temperature. She attends school and obeys her own inclination as to activities which, as experience has shown, do



not alter the velocity of the reaccumulation of fluid. Taps were necessary every 3 to 4 weeks. Recently, however, the interval has appeared to be a few days longer. Moreover, ascites does not recur to the same extent as formerly. The implications of these two observations are not clear. Exploratory operation has not appeared to alter the course significantly.

During this time there has been no significant change in red blood cell count or in hemoglobin. The serum proteins have remained normal (6.6 gm per cent, albumin 4.2 gm per cent, globulin 2.2 gm per cent on May 11, 1935) on each occasion they have been examined. On October 16, 1936 the low value of 5.5 gm per cent (albumin 2.8 gm per cent, globulin 2.2 gm per cent) was obtained after tap when dilution of the blood may have been present as a consequence of diuresis<sup>9</sup>.

The fluid removed from the pericardial cavity has exhibited on all occasions essentially the same characteristics. The specific gravity varied between 1.016 and 1.020, the cell count from 30 to 70 cells, most of them lymphocytes, per c mm. The total protein content of the fluid measured 6.2 gm per cent (albumin 2.5 gm per cent, globulin 3.7 gm per cent) on April 20, 1936. As has already been indicated, guinea pigs inoculated with fluid on April 25, 1935 and December 21, 1935, and with ascitic fluid on March 16, 1936, did not develop tuberculous lesions.

#### *Procedure of Pericardial Tap*

Before the first few taps were performed the patient was given morphine or amylal. It was found, however, that nausea and vomiting frequently occurred after the operation. The patient then requested that drugs be withheld, since this has been done she has experienced no discomfort.

The patient is propped up in bed, so that she is sitting almost upright. The operation is carried out under the usual sterile precautions. After infiltration of the skin and subcutaneous tissue with novocaine an 18 gauge needle is inserted in the fifth rib interspace, slightly outside the nipple line. The needle is inserted parallel to the chest

wall so that it enters the pericardial cavity parallel to the heart. Before inserting the needle it is attached to a 3 way stop cock and a 50 c c syringe. On each occasion fluid has been readily obtained. It is drawn into the syringe and delivered by the stop cock into a beaker. The use of a syringe permits slow removal of the fluid. During removal of the fluid respirations become easier, the neck veins less distended and cyanosis fades. The apical impulse may become visible and toward the end of the tap the cardiac impulse has been felt at times against the needle. When this occurred the patient did not complain of pain but experienced a vague uneasiness. As much fluid is removed at each tap as can be obtained.

Before discussion of the therapeutic measures which present themselves in the case of this patient, the salient features which serve to delineate the situation might be recapitulated. This patient, suffering from recurrent pericardial effusion, has been observed by us over a period of 21 months. As we have already described, she develops signs and symptoms of cardiac tamponade which have been found by experience to be a consequence of pericardial effusion. Removal of the pericardial fluid results in the disappearance of signs and symptoms for 10 to 14 days with a gradual return over the ensuing 10 to 14 days, when tap is again required. Over a period of 21 months, 23 therapeutic pericardial taps have been required. At first it was the notion that the patient was suffering from a tuberculous lesion of the pericardial cavity. Guinea pigs inoculated with the pericardial fluid and abdominal fluid, however, did not develop tuberculous lesions and on the other hand, the patient has a negative tuberculin test. Section of the pericardium later revealed chronic inflammatory tissue only. The lining layer of mesothelial cells was lacking. X ray of the chest did not show evidence of tuberculous lesion of the parenchyma of the lung. The patient neither exhibited on examination nor gave a history of the stigmata of rheumatic infection. It seemed to us that exploratory investigation of the pericardial sac was in order, by chance there might be mechanical obstruction leading to the

accumulation of fluid in the sac None was found at operation and the microscopic examination of the sac did not reveal evidence of acid fast infection This operation, viewed after one year, has not appeared to alter the course of the disease

### THERAPY

Several methods of therapeutic approach to this problem other than those already tried have been considered but we have been unwilling to resort to any of them These may be discussed briefly

1 Simple opening of the pericardial sac and leaving it open to the mediastinum did not result in alteration of the course, since reaccumulation of fluid continues to occur Either the two edges of the pericardium finally approximated and healed, or the margins of the sac adhered to the mediastinum, and the anterior mediastinum has become a part of the pericardial sac sealing the defect

2 Total excision of the pericardial sac was discussed before and at the time of operation, since there was reason to believe from analysis of the available data that it could be removed safely Not knowing the mechanism of the formation of the fluid it appeared that two untoward consequences might ensue (a) continued recurrence of fluid and the virtual reformation of a pericardial cavity, the parietal component being formed by the mediastinum, or (b) that adhesions might form in an irregular trabeculated fashion and fluid reaccumulate in pockets which could not be drained satisfactorily by tap

3 Removal of part of the pericardial sac with scarification of the posterior part of it and of the heart in an attempt to produce adhesions to obliterate the cavity This was discussed and decided against for the reason already given (2b)

4 The situation could probably be approached surgically if the pericardial sac could first be made adherent to the heart In short, if the pericardial cavity were obliterated by adhesion of the two layers, the fibrous pericardium could be stripped off later if evidence of constriction ap-

peared. The use of irritants such as permutit<sup>10</sup> and powdered bone dust<sup>11</sup> have been considered. We have been deterred from their use by the fear of adhesions giving rise to pocket formation which we could not adequately relieve by tap.

5 The use of an oil or lipiodol in the pericardial cavity when fluid was removed, as has been done in the treatment of tuberculous pericarditis has been considered<sup>12 13</sup>. The objections to this may be the same as those already mentioned. It is possible, however, that at some time the effects of small amounts of oil left in the pericardial cavity at the time of the tap, will be tested.

There are two measures which appear to be contraindicated in the treatment of pericardial effusion per se, but may, of course, be required for another condition which may be present. If these opposing interests arise, the need for these measures would have to be balanced against the contraindications. We refer to venesection and to the use of digitalis. First with regard to venesection, the rise in venous pressure in this situation is a measure of the degree of obstruction to the inflow of blood, and of the extent the cardiac output is decreased thereby (Fig. 4). This head of pressure is required to force blood into the heart because of the increased intrapericardial pressure, lowering venous pressure by venesection may bring it to the level of the intracardiac pressure, a situation in which no blood would enter the right heart. With respect to the use of digitalis, there is this to be said. Stewart and Cohn<sup>14</sup> have shown and Stewart and his coworkers<sup>15 16</sup> have demonstrated again the observation that digitalis decreases the size of the heart. Giving digitalis presumably would make an organ whose diastolic size is already encroached on smaller still, a result which does not appear to be beneficial under these circumstances. On the other hand, with respect to its effect on contraction, namely an increase<sup>17</sup>, it would appear to be superfluous, because the heart is in all likelihood putting out in unit time all the blood which gets into its cavities.

## OBSERVATIONS

*Effect of Pericardial Effusion on Cardiac Output* There was opportunity to measure the cardiac output on several occasions before and again after pericardial tap. On April 30, 1935, after 1100 cc (1st tap) had been removed on April 24, 1935, the cardiac output measured 3.00 liters, equivalent to 3.00 l/sq m/min, and 26 cc per beat (Fig 1). On May 24, 1935 when fluid had reaccumulated and the patient exhibited the signs and symptoms of cardiac tamponade which have been described, the cardiac output had fallen to 2.03 l/min, which amounted to 1.83 l/sq m/min and 20 cc per beat. On May 25, 1935, 600 cc of fluid was removed (2nd tap) and 48 hours later the cardiac output had increased to 2.46 l/min or 2.26 l/sq m/min and 25 cc per beat. Results similar to these were obtained on three other occasions (the third tap, June 21, 1935, the seventh, November 6, 1935, the thirteenth, February 27, 1936). In short, the cardiac output per minute, and cardiac index and output per beat were decreased when fluid was present in the pericardial cavity and increased following its removal. The measurements made after the exploratory operation revealed no significant trends from those recorded before operation (Fig 1, February 27, 1936).

*Effect on Venous Pressure* The venous pressure was measured whenever the cardiac output was estimated, as well as on many other occasions. The accumulation of fluid in the pericardium was found to be associated with rise in venous pressure, varying between 159 and 235 mm saline (Fig 1), at the time the cardiac output was diminished, and fell to normal level after tap (55 to 83 mm saline), the cardiac output now having increased.

*Effect on Circulation Time* The arm to tongue circulation time varied between 10.6 and 11.2\* seconds when pericardial effusion was present and became shorter on each occasion after tap, falling so that the range became

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\* The average time for normal children from 8 to 16 years of age is 8.6 seconds, the range 5.0 to 13.5 seconds (18).

6.1 to 9.8 seconds (Fig 1) The longer circulation times were found when the cardiac output was decreased and the venous pressure elevated and the shorter ones after tap when the cardiac output was greater and the venous pressure normal (Fig 1)

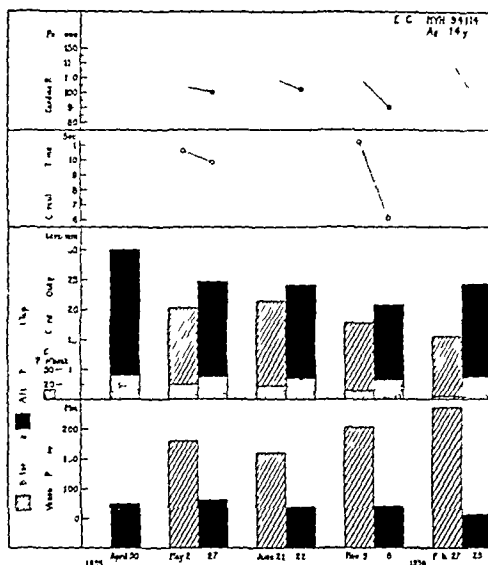


Figure 1,

In this figure are presented data relating to venous pressure, cardiac output, circulation time and cardiac rate in the presence of pericardial effusion. Observations are recorded before as well as after pericardial tap

*Effect on Cardiac Rate* The heart rate was faster when the sac was distended with fluid than it was after pericardial tap (Fig 1). This was found to be the case on each occasion, the slowing resulting from relief of the tamponade was, however, greater on some occasions than on others. This variation is no doubt accounted for by the amount of fluid which was present before tap, and the amount removed.

*Effect on Blood Pressure* The blood pressure followed no fixed pattern. It was low when the patient was in her

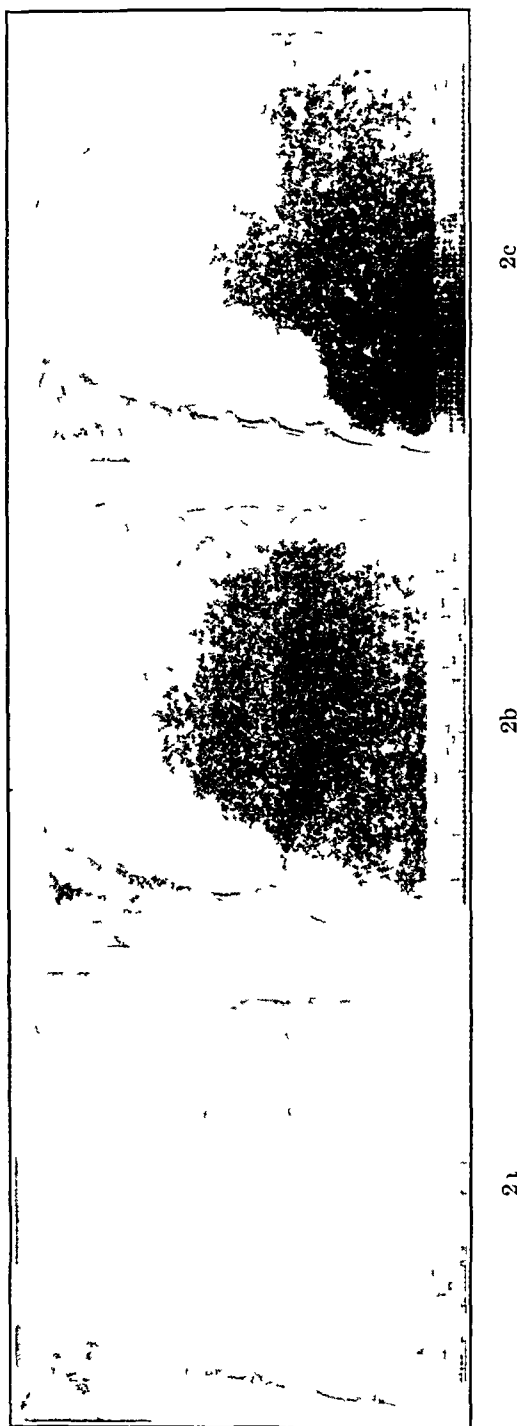


Figure 2

In this figure are reproduced X-ray photographs of the cardiac silhouette taken at a distance of 2 meters. Photograph 2a was taken on April 30, 1935 after pericardial tap, 2b was taken on May 24, 1935 before, and 2c on May 25, 1935 after 600 cc of fluid was removed from the pericardial cavity.

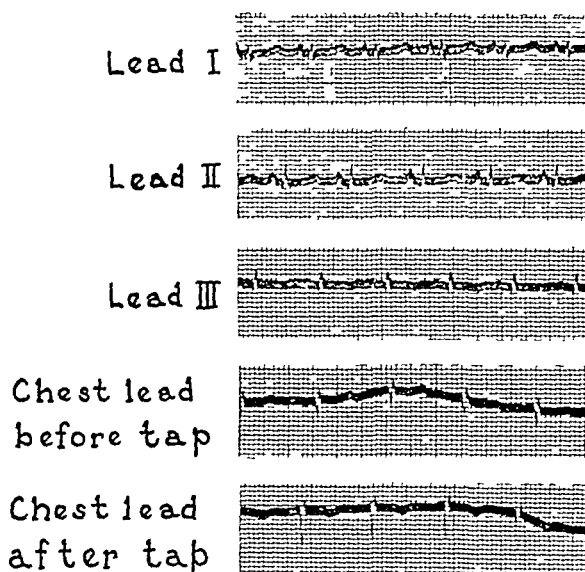


Figure 3

In this figure are shown electrocardiographic records of this patient. From above downward the first 4 photographs are Leads I, II, III and IV (chest lead) respectively, taken on May 24, 1935 when there was fluid in the pericardial cavity. The record at the bottom is lead IV (chest lead) taken on May 27, 1935 after 600 cc of fluid was removed from the pericardial cavity.

best state, since pericardial tap was at times followed by slight rise and at other times by slight fall in pressure no conclusions can be drawn from this case.

*Effect on Cardiac Silhouette* When there was fluid in the pericardial sac the cardiac silhouette was large and became correspondingly smaller after tap, but not all of the fluid being removed the true size of the heart was not revealed. It did not appear large, however, either on physical examination or when it was exposed at operation (November 15, 1935). When there was fluid in the pericardial cavity the cardiac silhouette assumed the water bottle configuration commonly associated with this lesion (Fig 2b, May 24, 1935). Its shadow had decreased in size (Fig 2c) on May 27, 1935, after the removal of 600 cc of



fluid In Figure 2a, April 30, 1935, the cardiac silhouette was the smallest that has been recorded

*Electrocardiograms* The electrocardiogram showed QRS complexes of low magnitude (Fig 3) in all leads There was no significant change in the electrical axis with change in position of the patient, either when there was fluid in the pericardial cavity, or after its removal, or after the exploratory operation On several occasions the amplitude of the QRS complexes in the chest lead<sup>19</sup> increased after pericardial tap (Fig 3)

*Effect on Vital Capacity* The vital capacity of the patient was decreased with respect to that of a normal girl of her age\* The vital capacity on all but one occasion was less when the fluid was present in the sac than after tap One set of observations may serve as an example The vital capacity on May 24, 1935, measured 900 c c After removal of 600 c c of pericardial fluid, the vital capacity on May 27, 1935 measured 1100 c c To a certain extent the alterations in vital capacity are no doubt reflections of the encroachment of the pericardial contents upon the space usually occupied by the lungs

*Effect of Pericardial Tap on Output of Urine* On the occasion of the twenty-third admission, November 16, 1936, the patient remained in bed two and a half days before tap and two and a half days after pericardial tap, in order to keep account of the fluid intake and output The output of urine was approximately three times greater the day after tap than the day before (1020 c c and 385 c c respectively) In short, the output of urine appeared to increase following tap

## DISCUSSION

It appears therefore that when fluid accumulated in the pericardial cavity in sufficient quantity to give tamponade effect the venous pressure rose, the cardiac output became less, the output per beat smaller, the circulation time

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\* According to the Wilson and Edwards (20) standards the vital capacity of this patient on May 27, 1935 was approximately 50 per cent below the average for her size

longer and the heart rate faster. On removal of the fluid by mechanical means (tap) the venous pressure fell, the cardiac output increased per minute and per beat, the circulation time became shorter and the heart rate slower (Fig 1). In other words, there is great decrease in the capacity of the heart as a pump when there is increase in fluid in the pericardial cavity. The fluid in the sac interferes with the filling of the heart and as it increases there is progressive increase in its interference, which is objectively identified by the rise in venous pressure. The cardiac output per minute and per beat appear to decrease because of the decrease in amount of blood that enters the right heart, for the heart can put out only the amount of blood that is available to it, moreover, since the diastolic size of the heart is restricted its output may be decreased because of limitation of extent of its contraction. A correlation appears between venous pressure and cardiac output in cardiac tamponade as illustrated by the case of this patient. The venous pressures (Fig 4) have been arranged in decreasing order, disregarding chronological sequence, and

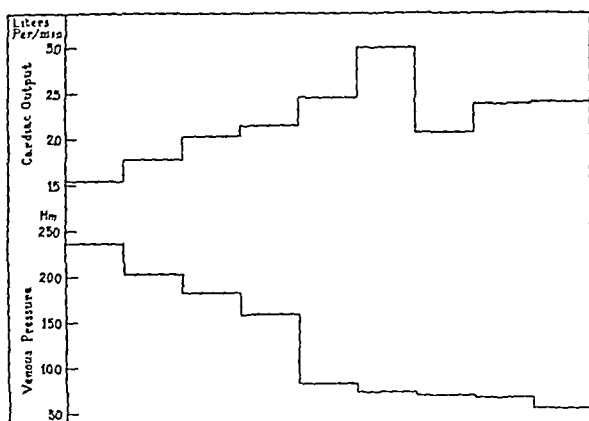


Figure 4

In this figure are recorded data relating to venous pressure and cardiac output. The observations of venous pressure have been plotted in decreasing order, disregarding chronological sequence. Above venous pressure have been plotted the corresponding measurements of cardiac output (see text).

above them have been plotted the corresponding levels of cardiac output (Fig 4). A step like decrease in venous pressure is associated with a step like rise in cardiac output. For the elevated venous pressures the two curves are approximately mirror images of each other. At the higher levels of venous pressure (235 mm) the cardiac output is greatly diminished (1.54 l/min) and as the venous pressure falls, the cardiac output increases in a surprisingly uniform fashion, this relationship being maintained until the venous pressure has fallen to 83 mm, the normal range, where fluctuations in cardiac output are observed. This relationship attains added significance through consideration of the fact that these observations were made over a period of many months and are plotted without chronological sequence. The rise in venous pressure appears then to give a measure of the decrease in cardiac output and the degree of tamponade.

On two occasions the pressure in the pericardial sac was measured and found to be 100 mm and 75 mm of the fluid, respectively. The effect of removal of successive increments of fluid on the venous pressure was observed on two occasions. On inserting the needle into the pericardial cavity the venous pressure fell sharply from 198 mm to 155 mm on February 27th, 1936 (Fig 5). In short, the fluid which flowed into the tapping system was sufficient to relieve tension in the sac, the venous pressure then fell rapidly with the removal of each 50 to 100 c c, reached 100 mm when about 400 c c had been removed and after that its fall was more gradual. Results indicating similar trends were observed on the second occasion. These observations do not throw light on the degree of distensibility of the pericardium in normal human beings, since in this case it underwent frequent stretching and remained distended so long that it remained large permanently and did not shrink to encase the heart completely at any time. This was the observation at operation, for after removal of the fluid it was left as a thin walled, wrinkled sac, it is this which filled until tamponade occurred. In this instance, considerable amounts accumulated before embarrassment

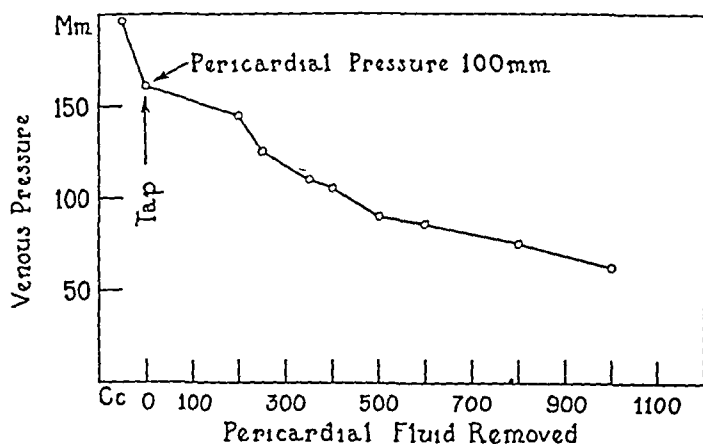


Figure 5

In this figure is shown the fall in venous pressure with the removal of successive amounts of pericardial fluid, together with the intrapericardial pressure

was evident. Care was exercised at each tap to remove fluid slowly in order to allow for circulatory adjustments and to prevent rapid dilatation of the heart.

Fineberg<sup>1</sup> has found in acute pericardial distention that approximately one third the weight of the heart in cubic centimeters of saline can be injected into the pericardial cavity before interference with ventricular filling (estimated by rise in venous pressure) occurred in dogs. He makes the estimation that 80 to 100 cc of pericardial fluid can be present before a rise in venous pressure occurs, if relations observed in animals obtain in human beings. As a consequence of these observations it may be inferred that the pericardial sac offers ample margin by which the normal heart may dilate. What is measured under the conditions of Fineberg's observations may not be so much the degree of distention of the pericardium but rather the amount the heart volume may be compressed or encroached upon.

The mechanism of formation and absorption of pericardial fluid is not understood. The lymphatic drainage has not been adequately studied. It was thought that the absorption of dyes from the pericardial cavity in this

patient might throw some light on the size of the molecules that could be absorbed from this cavity. The plan was as follows and observations were made on two occasions. After removal of as much pericardial fluid as possible and while the needle was still in place phenolsulphonephthalein 2 c c was injected into the cavity. The rate of excretion of the dye in the urine was followed. On the first occasion, January 18, 1936 (eleventh tap, 1200 c c) more than 75 per cent of the dye was recovered in the urine within 24 hours, one of the intermediary specimens was lost and the total amount excreted is not known. On the second occasion, September 16, 1936 (twenty-second tap, 1800 c c), 99 per cent of the dye was excreted in twenty-five and one-half hours. The excretion was somewhat slow in reaching a maximum but was for the most part all removed from the cavity in twenty-four hours. Thus, this dye given intra-pericardially reaches the blood, and finally the kidney.

On the other hand, the dye given intravenously apparently did not find its way into the pericardial cavity. On November 19, 1936, at 1 p m phenolsulphonephthalein 1 c c was given intravenously. At 1 30 p m pericardial tap number 23 was performed and 1000 c c of fluid removed. Dye could not be detected in the pericardial fluid, the patient had excreted all the dye in the urine at the end of four hours.

On one occasion, June 2, 1936 (eighteenth tap, 650 c c of fluid) vital red, 1 0 c c of 1 5 per cent solution for each 5 kgm, a total of 6 c c, a dye having a larger molecule than phenolsulphonephthalein was placed in the pericardial cavity at the conclusion of the tap. Colorimetric titration was not resorted to but amounts detectable by the naked eye were not excreted in the urine in the following thirty-five hours. At the time of the next tap (the nineteenth) on July 1, 1936, that is, twenty-nine days later, the fluid removed was dark pink in color (usually greenish yellow) indicating the presence of the dye at the end of one month and that it had not been absorbed. On February 2, 1936, the patient was given 3 c c of 1 5 per cent vital red at 1 15

p.m. intravenously. At 5:15 p.m. pericardial tap was done and 1150 c.c. of fluid was removed. The dye could not be detected in the fluid on gross examination. In short, dye of this size molecule given intravenously does not find its way into the pericardial fluid at the end of four hours. From these observations we make the inference that molecules of the order of phenolsulphonephthalein were absorbed readily from the pericardial cavity while the larger molecule represented by vital red was not absorbed but remained in the cavity. On the other hand, neither the small molecule of phenolsulphonephthalein nor the larger one of vital red, in the concentrations given, found their way out of the circulating blood into the pericardial cavity at the time of examination. In all likelihood the small molecule of phenolsulphonephthalein was removed from the pericardial fluid by way of the sub epicardial capillaries.

Our observations with respect to the absorption of dyes of different molecular sizes no doubt find their explanation in the observations made by Drinker and Field<sup>21</sup> relating to absorption from the pericardial cavity in rabbits. They found that simple solutions are absorbed by the sub epicardial blood capillaries, on the other hand, serum and graphite particles were removed very slowly. The small molecular size of phenolsulphonephthalein apparently permits of its ready transfer into the sub epicardial capillaries, the large size of the vital red molecule no doubt places it in the category represented by serum and graphite particles. Entrance into the lymphatic stream from the pericardial cavity apparently occurs only with the greatest difficulty and very slowly (Drinker and Field<sup>21</sup>).

We have no data which permit us to draw conclusions regarding the nature of the defect which is responsible for the formation of pericardial fluid in excessive quantities in this patient. The chemical nature of the fluid in all probability accounts for its not being absorbed. The fluid on one occasion, April 20, 1936 (sixteenth tap) had approximately the same total protein content (both albumin and globulin) as the blood of this patient, the osmotic pressure of the two fluids would be approximately identical, this

being the case there would be no opportunity for the passage of fluid from the cavity into the sub epicardial blood capillaries. On another occasion (the twenty-third tap on November 19, 1936) the total protein content of the pericardial fluid (seventeenth tap) measured 4.2 grams per cent (albumin 1.2 gm, globulin 2.6 gm) and the serum protein 6.7 gm per cent (albumin 2.9 gm, globulin 2.9 gm).

### SUMMARY

The case of a patient whose presenting lesion is recurrent chronic pericardial effusion has been described. On the basis of the negative data which have been accumulated the etiology is at present unknown. That it is the result of a chronic low grade infection must be kept in mind. The usual clinical evidences of infection are, however, lacking. That it may be a disturbance in the mechanism of formation or resorption of pericardial fluid is a possible explanation. Evidence in favor of this may be found in the observation that the mesothelial layer of cells lining the parietal pericardium were lacking. Whether this layer of cells was stripped off during its removal, fixing and preparation for examination we are unable to state. The very nature of the fluid found in this particular case, in the light of known facts, makes its resorption difficult once it has been poured into the cavity. Exploratory operation after one year has not appeared to alter the course of the disease significantly. The possibility of further surgical intervention has been discussed without having the way made clear as to the best procedure.

We have had occasion to make many clinical observations in this patient and these allow us to restate the clinical manifestations of cardiac tamponade which develop gradually. (1) The evidence of obstruction to entrance of blood into the heart is revealed by the distended veins, particularly those of the neck, and objectively by a rise in venous pressure, (2) dyspnea, (3) edema of the face, eyelids and forehead, (4) pulmonary congestion and pleural effusion, (5) enlargement of the liver, (6) ascites, (7) edema of the extremities, (8) tachycardia, (9) paradoxical pulse has

been a constant finding in our experience, (10) the heart sounds may be distant, (11) the area of cardiac dullness is increased and Ewart's sign, and Rotch's sign may be found, (12) the Roentgen ray photograph reveals the water jug contour and on fluoroscope examination, the diminution or absence of cardiac pulsation may be observed, (13) in our experience there has been no correlation of blood pressure changes with the presence of fluid, the pulse pressure is usually small, (14) the electrocardiograms obtained of this patient as well as those already recorded in the literature, indicate that the QRS complexes are usually of low voltage in the presence of pericardial effusion. This configuration of the electrocardiogram does not appear to be pathognomonic of pericardial effusion, for, to give one illustration, it appears to be characteristic also of chronic constrictive pericarditis.

Our studies of the circulation have revealed these facts. In the presence of chronic pericardial effusion in the case of this patient (1) there occurs a rise in the venous pressure, (2) the circulation time becomes longer, (3) the cardiac output per minute and, more significantly, per beat is diminished, (4) the intrapericardial pressure is increased, (5) the rise in venous pressure appears to be a very good measure of limitation in cardiac output in this instance, for it seems to be a fact that successive increments of rise in venous pressure result in decrease in cardiac output. There is change in the reverse direction of all these with removal of pericardial fluid.

We have made certain observations on the passage of dyes from the pericardial cavity into the circulation and from the circulation into the pericardial cavity. We chose two dyes, one, phenosulphonephthalein, has a small molecule. It appears that it finds its way with moderate rapidity from the pericardial cavity into the blood stream and is excreted in the urine in its total amount in approximately twenty four hours. On the other hand, vital red, having a larger molecule, introduced into the pericardial cavity was present in its fluid four weeks later, and detect



able amounts did not appear in the urine. It is likely that the removal of the small molecule of phenolsulphonaphthalein was by way of the sub-epicardial capillaries as Drinker and Field<sup>21</sup> have found to be the case in rabbits.

These same dyes introduced intravenously did not appear in the pericardial fluid at the times observations were made. The similarity in the protein content of the blood may account for failure of resorption of the fluid.

From our clinical and laboratory examinations as time has gone on, no developments have appeared which lead us to a clearer understanding of this puzzling case.

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# SCHEDULE OF LECTURES AND HOSPITAL DEMONSTRATIONS IN THE MODERN METHODS OF DIAGNOSIS AND TREATMENT OF SYPHILIS

*Sponsored by The New York Academy of Medicine  
at the request of the Commissioner of Health*

## WEEKLY LECTURES AT THE ACADEMY

WEDNESDAY AFTERNOONS AT 4 30 O CLOCK

- 1 History and Etiology of Syphilis, Howard Fox—February 3
  - 2 Common Types of Primary and Secondary Syphilis, Louis Chargin—  
February 10
  - 3 Unusual Types of Primary and Secondary Syphilis, W Bayard Long  
—February 17
  - 4 Prenatal and Congenital Syphilis, Isidore Rosen—February 24
  - 5 Significance of Serologic Tests in Syphilis, A Benson Cannon—  
March 3
  - 6 Epidemiology of Syphilis, C Walter Clarke—March 10
  - 7 Treatment of Syphilis, Leo Spiegel—March 17
- 

## PRACTICAL DEMONSTRATION OF PATIENTS, METHODS OF DIAGNOSIS AND TREATMENT IN THE FOLLOWING CLINICS, FEBRUARY 8 TO MARCH 27, 1937

*Borough of Manhattan*—Bellevue Hospital, Howard Fox, Monday and  
Thursday, 2-3

Health Dept Clinic, Louis Chargin, Tuesday and Thursday, 9-10 30

Harlem Hospital, Samuel Irgang, Friday, 3-4

Lenox Hill Hospital, Leo Spiegel, Monday and Friday a m

Mt Sinai Hospital, Isidore Rosen, Tuesday and Saturday, 2-3 30

St Luke's Hospital, W Bayard Long, Mon and Thurs, 1 30-3

Vanderbilt Clinic, J Gardner Hopkins, Monday, 3-4 and Thursday,  
4-5, beginning March 1st

Skin and Cancer Unit, Post-Graduate Hospital, George Miller  
MacKee, Monday and Saturday, 2-4

*Borough of Brooklyn*—Health Dept Clinic, George F Hogan, Tuesday  
and Friday, 9-12

Long Island College Hospital, Moses Silverman, Wednesday and  
Friday, 9-12

Kings County Hospital, Alfred Potter, Wed and Sat, 9-12

*Borough of Queens*—Queens General Hospital, Rudolph Boenke,  
Tuesday and Thursday, 3-4

*Borough of Bronx*—Morrisania Hospital, Samuel Feldman, Tuesday  
and Friday, 9-11

*Attendance is open to members of the medical profession*

## 1 THE SIGNIFICANCE OF PREGNANCY FOR THE TUBERCULOUS WOMAN

J BURNS AMBERSON, JR.

During the childbearing age tuberculosis is the most fatal of all diseases in women. Young women particularly may develop small pulmonary infiltrations which cause few or no symptoms, may not give rise to abnormal physical signs, but can almost always be identified by the X-ray. Such lesions are unstable and have a tendency to break down rapidly and spread. Various factors, including pregnancy, may favor progression of the disease. Tuberculous women should be advised against becoming pregnant until the pulmonary lesions have been arrested and apparently healed under normal conditions of life for at least two years. Women who have early exudative or poorly healed lesions are in danger from the tuberculosis, and pregnancy must be considered a liability, even though the tuberculosis may not be producing obvious symptoms such as fever. In every case, complete examinations should be carried out in order to estimate the potential menace of the disease. The significance of the pregnancy can then be estimated with reasonable accuracy. Modern therapy opens the prospect of pregnancy to women who otherwise could never be advised to undertake it. The ideal is to detect the tuberculosis by proper case finding methods before the woman becomes pregnant, or at least in the first month of pregnancy. This insures better control of the situation than any other method.

## 2 TUBERCULOSIS FROM THE POINT OF VIEW OF THE OBSTETRICIAN

HARVEY B. MATTHEWS

Motherhood is the cherished hope of every woman. Usually during adolescence and young womanhood this desire is most manifest, and it is the age of highest incidence of Pulmonary Tuberculosis. The problem, therefore, assumes importance. Opinions, rendered by combined decisions of the tuberculosis Specialist, the expert Obstetrician, the Pediatrician, the Roentgenologist, and the Pathologist, for the individual who desires or becomes pregnant is advisable. We have no right to say "No woman with tuberculosis can safely bear children", nor can we please Mussolini and say "tuberculosis doesn't matter, let her go ahead and have children—the country needs them for soldiers."

"A middle of the road" attitude can give successful results, in a good proportion of cases, when judged by a group with a reasonable thorough understanding of the two conditions in association. Success also is dependent on the cooperation of the patient.

If tuberculous women who wish to become pregnant or who are already pregnant have "taken the cure" and have learned how to live—and have the character and determination to carry out a rigid regime—there is no good reason for them not to procreate. On the other hand, pregnancy in the active tuberculous patient, no matter how little tuberculosis is present, is dangerous—in some cases very dangerous. Therapeutic abortion, therefore, should be performed.

In the moderately advanced active cases, pregnancy is very dangerous. However, if 3 or 4 or more years are allowed to elapse following "arrest", during which time the general health has remained satisfactory, pregnancy may be undertaken with comparative safety even in these cases.

In advanced cases, especially with cavitation, it goes without argument, that pregnancy is absolutely contra-indicated.

### 3 THE CARDIAC FUNCTIONAL CAPACITY AS AN AID TO PROGNOSIS DURING PREGNANCY

HAROLD E. B. PARDEE

Cardiac functional capacity was discussed and its application to pregnant women outlined in detail. A series of 52 deliveries was reported from the Woman's Hospital and the Cardiac Clinic of the Polyclinic Hospital with only one death which could be attributed to an aggravation by the pregnancy. Of 28 patients with Class 1 functional capacity two developed slight cardiac symptoms during pregnancy or shortly afterwards. Of 21 patients in Class 2-a when first seen, one showed evidence of cardiac strain during and for several days after labor and died three months later, after her return home. Three became 2-b during the last trimester. One of these pregnancies was interrupted at the sixth month, the other two went to term. The other 17 patients in Class 2-a passed through pregnancy and were delivered without noteworthy tachycardia or dyspnea. Of the three patients presenting themselves in Class 2-b, two had normal deliveries, and one a cesarean. All made good recoveries. The importance of the complication of continuous auricular fibrillation was stressed. Recommendation was made that the pulse and respirations be counted every 20 minutes during labor and that a pulse over 110 with respirations over 25 should be considered a sign of approaching heart failure. It was concluded that the functional capacity rating is useful in predicting the reaction of the heart to pregnancy and labor.

#### 4 HEART DISEASE FROM THE VIEWPOINT OF THE OBSTETRICIAN

NICHOLSON J EASTMAN

There is general agreement that cases of heart disease in pregnancy are best handled by the obstetrician and cardiologist in close cooperation. The chief responsibility of the cardiologist is to establish the diagnosis of rheumatic heart disease and to estimate the functional capacity of the heart. The latter is best expressed in terms of the classification of the New York Heart Association. To the obstetrician it now falls to adjust the work imposed by pregnancy and labor in such a manner that it can be easily accomplished by the cardiac force at hand. As a result of the increase in cardiac output which occurs in pregnancy, the heart is obliged to perform on an average 50 per cent more work than it did in the pre gravid state. The work in labor varies with certain obstetrical factors, notably parity, and if need be can be reduced to a minimum by operative delivery, that is by forceps delivery, and if the cardiac reserve be very low, by caesarean section. The successful handling of these cases necessitates adequate rest during pregnancy, avoidance of upper respiratory infections, recognition of early signs of heart failure, and punctilious care during labor.

#### 5 HYPERTENSION, CHRONIC NEPHRITIS AND THE TOXEMIAS OF PREGNANCY

From the Viewpoint of the Internist

ALVIN J B TILLMAN

A comparison of the clinical courses of essential hypertension, chronic nephritis, and toxemia of pregnancy is made. The pathology of all three disturbances is compared. The course, extending over many years, of patients who have had toxemia of pregnancy is illustrated. This is contrasted with the course of essential hypertension. The pathological lesions of the former in the follow-up period are shown to be identical with the latter. As a result, it is urged that the term chronic nephritis be used very carefully in reference to the cases of post-toxemia of pregnancy. It is also suggested that the main lesion is arteriolar sclerosis.

#### 6 HYPERTENSION, CHRONIC NEPHRITIS AND THE TOXEMIAS OF PREGNANCY

From the Viewpoint of the Obstetrician

R GORDON DOUGLAS

In 11,336 consecutive patients seen in The New York Lying in Hospital, there were 1299 instances of toxemia, an incidence of 11.47

per cent These patients were grouped according to the classification of Stander and Peckham

The concept that pre eclampsia and eclampsia represent a single disease entity distinct from the other toxemias is presented Evidence is cited illustrating definite pathological changes in the cardio renal-vascular systems of at least one quarter of such patients in follow-up studies

The "Unclassified" Toxemias at the time of discharge of the patient from the hospital were observed for varying periods of time up to three years, at which time it was found that twice as many presented signs of cardio-renal-vascular changes as were found to be normal Even some patients that had a diagnosis of "Low Reserve Kidney" when discharged from the hospital were found to have more or less permanent changes in their renal or vascular systems, after a similar period of observation

Because of such findings, repeated follow-up observations of all patients manifesting evidence of hypertension or albuminuria during pregnancy is strongly advocated, and the important role played by the obstetrician is the diagnosis and the interruption or prevention of pregnancy in such individuals

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## RECENT ACCESSIONS TO THE LIBRARY

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## 44 BULLETIN of THE NEW YORK ACADEMY of MEDICINE

### II GENERAL DISCUSSION

#### SECTION OF GENITO URINARY SURGERY—December 16

##### I READING OF THE MINUTES

- II PAPERS OF THE EVENING—a The indications for transurethral resections Frank C Hamm (by invitation) b Technique of transurethral prostatic resection Reed M Nesbit Ann Arbor (by invitation) Discussions Thomas J Kirwin Joseph F McCarthy Nathaniel P Rathbun Alexander R Stevens W Calhoun Stirling Washington D C

### III GENERAL DISCUSSION

#### SECTION OF OTOLARYNGOLOGY—December 16

##### I READING OF THE MINUTES

- II PAPERS OF THE EVENING—a Embryology and physiology of the tonsil W H Rogers Dept Anatomy College of Physicians and Surgeons (by invitation) b Pathology of the tonsil and related mucous glands and bronchiogenic cysts Louise H Meeker c Anesthesia in tonsillectomy, Charles S Hunt (by invitation) d Indications for and choice and mechanics of operations Joseph D Kelly (by invitation) e Results from operations postoperative care (data on rheumatism arthritis cardiovascular and systemic disease), William H Turnley
- III GENERAL DISCUSSION OPENED BY—Charles Hendee Smith Lee M Hurd, Ward J MacNeal, Arthur Nilsen Lucile V Moore (by invitation) David H Jones Clarence H Smith

### IV EXECUTIVE SESSION

#### SECTION OF ORTHOPEDIC SURGERY—December 18

##### I EXECUTIVE SESSION—a Reading of the Minutes

- II PAPERS OF THE EVENING—A Symposium on Weak Feet a Criticism of the ordinary shoe, Dexter D Ashley b Treatment of pronated feet J J Nutt c Conservative treatment in weak feet, Armitage Whitman d A pediatrician looks at weak feet Royal S Haynes e Treatment of weak feet by naviculo cuneiform arthrodesis Felix L Butte (by invitation) f Some observations in the operative correction of weak feet Paul Lapidus (by invitation) g Value of rigid foot braces, Edgar D Oppenheimer

#### SECTION OF OPHTHALMOLOGY—December 21

*Program arranged by THE MANHATTAN EYE EAR AND THROAT HOSPITAL*

*Instructional Hour 7 00 to 8 00 P M*

- SYPHILIS OF THE EYE—Andrew Anderson Eggston Frank Garai (by invitation) Discussion David Henry Webster

#### SCIENTIFIC PROGRAM

##### I READING OF THE MINUTES

- II REPORT OF CASES—a Oxycephaly (two slides) Girolamo Bonaccolto, b Melano sarcoma of limbus of cornea Rowland Hyde Merrill (by invitation) c Some observations on keratoplasty R Townley Paton d Effect of adrenalin on sympathetic nervous system of the eye Louis Hubert e Presentation of muscle case Charles E Davies (by invitation) f Technique of retinal detachment operation as practiced at the Manhattan Eye Ear and Throat Hospital Joseph Levine
- III PAPERS OF THE EVENING—a Summary of orthoptic work at the Manhattan Eye Ear and Throat Hospital Frank Conrad Keil Discussion Lewis Webb Crigler b Fundus lesion in polycythemia vera Martin Cohen

#### AFFILIATED SOCIETIES

##### NEW YORK MEETING OF THE SOCIETY FOR EXPERIMENTAL

##### BIOLOGY AND MEDICINE—December 16

- I Fluctuations in type 2 pneumococcus antibody during the menstrual cycle V Ross L R Peizer
- II Integrity of the skin in relation to cutaneous absorption of insulin M Bruger J Flexner
- III Carboxymethylcysteine metabolism its implications on therapy in cystinuria and on the methionine cysteine relationship E Brand R J Block B Kassell S F Cahill
- IV Factors affecting human potassium tolerance R L Zwemer R Truszkowski

- V A virus causing oral papillomatosis in rabbits R J Parsons J G Kidd (Introduced by P Rous)
- VI Effect of thyro parathyroidectomy in new born rats T N Salmon (Introduced by E T Engle)
- VII Effect of emmenin on gonadotropic hormone excretion in castrates and spontaneous menopause U J Salmon R T Frank

NEW YORK PATHOLOGICAL SOCIETY *in affiliation with*  
THE NEW YORK ACADEMY OF MEDICINE—December 17

- I CASE REPORTS—*a* An unusual case of cystadenoma of the uterus Charles Weitzman (by invitation) S H Polayes *b* Sudden death in a case of schistosomiasis of the lungs B M Vance *c* Botryomycosis in the human Alfred Plaut
- II PAPER OF THE EVENING—Mesonephroma ovarii Walter Schiller (by invitation)
- III EXECUTIVE SESSION

NEW YORK ROENTGEN SOCIETY—December 21

- I PRESENTATION OF CASES
- II PAPER OF THE EVENING—Cine fluorography William H Stewart F H Ghiselin (by invitation)
- III DISCUSSION
- IV EXECUTIVE SESSION

## DEATHS OF FELLOWS OF THE ACADEMY

BENEDICT, STANLEY ROSSITER, A B, Ph D, 477 First Avenue, New York City, graduated with the degree of Bachelor of Arts from the University of Cincinnati in 1906 and with the degree of Doctor of Philosophy from Yale University in 1908, elected an Associate Fellow November 4, 1931, died December 21, 1936

He was instructor in chemistry at Syracuse University from 1908-09, associate instructor in biological chemistry at Columbia University from 1909-10 and assistant professor of chemistry at Cornell Medical College from 1910-13 In 1913 he was made professor and head of the department

Professor Benedict had been president of the American Society of Biological Chemists from 1919-20 and vice president of the Harvey Society from 1920-21 He was a member of the American Association for the Advancement of Science and the National Academy of Sciences He was managing editor of the American Journal of Biochemistry

FINLEY, CAROLINE SANDFORD, M D, 135 East 74th Street, New York City, graduated in medicine from Cornell University Medical College in 1901, elected a Fellow of the Academy January 2, 1913, died December 28, 1936

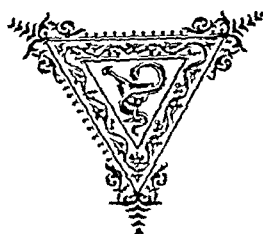
Dr Finley was consultant obstetrician to the New York Infirmary for Women and Children During the World War, she received a commission in the French Army and was decorated with the Croix de Guerre She was a member of the American Endocrinological Association, the American Medical Association and the County and State Medical Societies

MORRIS, LEWIS RUTHERFORD, M D, 1030 Fifth Avenue, New York City, graduated in medicine from Bellevue Hospital Medical College, New York City, in 1884, elected a Fellow of the Academy June 3, 1890, died December 9, 1936

*Dr Morris was one of the founders and a member of the board of trustees of the New York Zoological Society*

MYLES, ROBERT CUNNINGHAM, M D, 1075 Park Avenue, New York City, graduated in medicine from the University of Louisiana in 1874, elected a Fellow of the Academy October 3, 1889, died January 1, 1937

*Dr Myles held a certificate from the American Board of Otology and was a member of the American Otological Society, the American Laryngological, Rhinological and Otological Society, the American Medical Association and the County and State Medical Societies*



# BULLETIN OF THE NEW YORK ACADEMY OF MEDICINE

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Vol 13

FEBRUARY, 1937

No 2

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## *Anniversary Discourse*

### THE PROFESSIONS IN WORLD TURMOIL\*

JAMES GRAFTON ROGERS

New Haven

The world we live in has been engaged in recent years in an ecstasy of vast and lofty planning. Programs of a world democracy, then of universal peace under a super-state, then plans for economic equality and security which were first launched in Soviet Russia, and more recently in another form have seized the imagination of our own America, have marched like pageants across the stage of our ideals.

Today in a reaction from these visions half of Europe is following another desperate adventure into the night. This time it is the idea of nationalism achieved by armed force, the pursuit of God with a bayonet and the gas bomb. The capacity, indeed the subjectivity, of men and women in the mass for capture by almost any ideal which can be written large in the sky in tinted letters seems never to weaken. We follow still Peter the Hermit and Mahomet, and the Pied Piper as readily in these days of schools and communications and machines as we did in the past centuries of illiteracy, and village life, and wood, and meadow.

It takes some courage then when all the world is painting on the constellations with a brush made from a comet's tail, to use Kipling's simile, to deal as I propose to do

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\* Delivered before the New York Academy of Medicine, December 3, 1936

tonight with the mere saws and files and nails of our own work benches. In the end one suspects the movement and direction taken by the world of men is much more influenced by the routine ways and works of people than it is by their day dreaming. The coming of the stone hammer, and later of the iron plowshare, and of the steam engine, of the gasoline motor, of the tin can, and of the refrigerator, of machine-made clothes and of rayon, have had more to do with the molding of our life today, I suspect, than did Socrates and St. Augustine, Napoleon, and Marx. It seems possible that the most important thing in the world to the destiny of mankind is not its dreams or its hopes or its visions, but the coefficient of the ways its individual members live from day to day.

When we deal, as I am going to do for a few minutes, with what seem to me the trends affecting the day's work and the social position of the doctor and the lawyer, to get down to my muttons at last, the subject may well be in the light of 2000, A. D., for example, of considerable importance. The study in the changes of the daily life of the factory workman or of the house builder might be of even greater importance, but these last are not to doctors and lawyers as interesting as the surroundings of their own immediate lives.

Now, what is happening to the two professions, which I have named, in this present Twentieth Century? In the first place, why link at all the two professions? There need be no doubt on this whatsoever. Of all the highly skilled and regulated occupations open to men, the lives and work of the doctor and the lawyer are certainly today the most similar, and are in history among the most significant. In the long reach of the ages, only the priest who deals with men's souls has been as jealously watched by the public, as devotedly trained, as socially honored, as has been the doctor who deals with men's bodies, and the lawyer whose business is their property and their liberty. Today the priest has surrendered part of his older functions to the school and the printing press. His current position is altered.

The present day development of the medical and legal crafts with their numbers, their income, their organization, and their social status in modern communities, their regime of training so strikingly parallel is obviously a single topic in many respects. The doctor and the lawyer are blood brothers in the eyes of the average man. I seldom hear a youngster debating between the two professions as a career, because the tastes and interests which give proficiency are different. But once the choice is made, the novice must face almost the same practical problems in both careers. He must go through a similar period of training, he must expect much the same sort of income, and of social position in the community in which he lands. His conduct standards with their emphasis on loyalty to the patient or client tempered by allegiance to public policy, his peculiar relations inside his own profession, the limitations on advertising his wares, for example, are quite similar. Indeed, both professions pretend to be sciences, and try to be sciences, and both, I think, remain chiefly arts.

The link between them is not altogether new. Some day when you need a cool shower of humility, I suggest you turn to the little read back pages of Gulliver's Travels, if a doctor has time to read at all. There in Gulliver's account of the Kingdom of Horses, Dean Swift launches out at both of us. In what are almost parallel columns he accuses both professions of murder, fraud and greed. In the lawyer's jargon, he returns the same indictment, but the particulars pleaded are different. In the medical simile, we have the same disease, but the symptoms vary a little. These libels on the two brotherhoods, yours and mine, are in the end the same libel. We are both pronounced frauds who profit by disaster. Those whose enemies unite against them are friends, indeed.

Certain changes or trends underway in the last two centuries and accentuated in the present world turmoil, are modifying deeply the ways of life of both of these professions. There is a quite general agreement, for example, among observers on several of these sources of change

I propose to exclude changes in mere ideas or theories held by mankind about life, and to cling, instead, to causes or tendencies which can be definitely seen over a long stretch, and in the sense of science measured and counted. Then having so selected what is as near as may be an acknowledged set of long-curve developments, to go on a little to debate what they are doing to us, and what they seem likely to do in both professions.

On this plane we will not include the impendency of war which blazes in the headlines every morning this winter, nor will we include the sentiment for peace which four years ago seemed just as suggestive and influential and widely spread in the newspapers as today the alarm of war has come to be. Neither war nor peace are new. The oscillations between public sentiment for one and public sentiment for the other are recurrent through history. I omit also the political programs which are now pending in various places, including Washington. Such crusades as nationalism and communism and fascism are like other political phenomena, only fresh forms of old impulses, and demands, at most the product of much deeper causes. Hitler is doing very little that Napoleon did not do. He is even following the same methods. Even the current rise of materialism and the apparent retreat of organized religion from the center of the stage are probably only temporary fluctuations in the trench warfare between man's interest in his life today and his interest in life in eternity. We can deal with more permanent and sterner things than any forms of thought.

From such a viewpoint, in an effort to read not merely the page of human life that happens to be spread in the morning newspaper but in an attempt to read in the long book the chapter headings that have passed and the events and characters that the authors seem to be assembling for the unread pages to come, let us see what has happened to the world that really affects the life of the lawyer and the life of the doctor.

Since the days of Hippocrates and Plato, or even Harvey and Francis Bacon, some important events have intervened

to alter the life of everybody. One of these, for example, is the development of man's control over power, or, to put it another way, the use of the machine. The electric light, X-ray, automobile, telephone, and elevator, have all affected the doctor's work in recent years. The capacity to manufacture climate is probably upon us today. The microscope a little earlier was in turn a new use of power, involving the capacity to condense light and use it in a specially controlled fashion. Most inventions have affected also the lawyer's ways.

A second factor of increasing intensity is the change in population, and especially the increase in numbers, and its concentration in cities. This tide may wane. But if it does, we have not yet realized the full consequences of even our present conditions. Changes of population produce fresh medical and fresh legal problems. Most of the recent public problems connected with both medicine and law are produced by concentrations of population. New institutions, such as hospitals, subways, tenements, Tammany Halls, arise to vex the doctor and lawyer both. They are primarily the product of more intensive population collections.

A third factor is the cumulation of knowledge. The new world may not be wiser than the old world, but it is infinitely better informed. We know more facts whether we can govern affairs better or not.

A fourth factor is the cumulative rise in educational levels. This becomes of critical importance in our modern world. We are keeping people in school now for about a fifth to a third of their lives in this country. The increase is world wide, on a smaller scale. A learned profession has to be really learned for distinction in a community where everybody is going to school until he or she is fifteen. The public is today called upon to assume the cost of educating doctors because the wages of the profession during what is left of life after an internship, cannot compete on the average with other trades in the way of repaying the investment. The same will very soon be true of the lawyer.



Now, these four factors that have been named, namely the familiar harnessing of power into machines, and the crowding of the world, and the accumulation of scientific knowledge, and the steady rise in the average education of men are quite distinct and separate things. Any one trend could exist without the other but the interplay between them is very complex. We can detect none the less some of their mingled effects upon the professions of both medicine and law, and upon the lives and work of men enlisted in these curious crafts. We can, if we dare, let us say not as prophets, but as speculators, make some forecast of the alterations in the future.

The first conspicuous consequence on both professions is a great and sudden enlargement within the professions themselves of the time and intensity of training and apprenticeship. Since 1900, let us say, the typical, and I think the average period of training for the doctor has increased at least three years. Your more ambitious medical schools are now calling for a college degree before a student can begin his four years of medicine. This eight year period of university experience is only a foundation for a year or two of internship afterwards. Exactly the same sort of extension of training for law began twenty years later, but has moved with speed in the last fifteen years. The typical lawyer of a generation ago had about three years of college and law school study combined after high school. Today the typical new licensee in law has at least two years additional training as compared to his father's case, and perhaps three years on the average. There is talk everywhere of further increase.

This increase in the requirement for admission to the professions, so strikingly contemporaneous and similar, is due in part to the increase in the general level of schooling. It is due also in part to the greater knowledge required of the doctor. Stricter character and cultural requirements are expected of the lawyer. In part it is due to pressure of both professions within themselves for self-protection.

So long a period of preparation is expensive. It is costly both to the individual and to society. In other words, it

takes more of the student's time and more of some teachers' time, and of the people who look after the teacher. Legal, like medical education, is to become a heavy public charge. The cost of the medical school has driven more than one university president into the very hospital whose expenses were his ailment.

The education of the doctors and the lawyers has ceased to be a mere professional affair as it was a generation or two ago. Neither profession is any longer able to pay the costs individually in the sense of the individual students or collectively in the terms of the profession supporting training schools. The public budget of contributing either taxes or endowments has become the purse holder, and the classroom director. What the public may do to the form and content of the education of both professions which they now control, deserves some thought. A situation new in history has come about.

It is obvious with training so expensive and admissions to the schools now a favor instead of a thoroughfare to the student that selective admission on some kind of paternalistic basis as a system will succeed to the old open door policy. The opportunities for favoritism and privilege become acute. All sorts of new contingencies arise.

Another clear trend in both professions is towards stronger internal organization, unity and discipline. These are the consequences chiefly of severer educational requirements. The history of all crafts is that when they become difficult to enter the social walls are builded high around the group who are admitted. The American Medical Association has risen in the last generation to be one of the most closely knit and powerful expressions of a craft that the world has ever seen, outside of the military orders. The doctors have seen also a vast increase in state, local, and particularly of selective professional organizations. The same movement is in process in the law. The American Bar Association is a quarter of a century behind the American Medical Association, for various interesting reasons which we cannot stop to discuss, but it is now steering the same course. If the history of the organized trades is any

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guide (we have on this score libraries of experience covering centuries), this new comprehensive and intensive internal organization in the professions will have great issues

The classic and medieval guilds of merchants are a familiar model. It would seem likely that efficiency and ethical standards would rise. All men take pride in doing well. At the same time some evils will threaten. The new guilds may legislate for their own protection, they may want to shield their own monopolies and nourish their own interests, and be not always mindful of the public which they serve. Property and dogma may rise and demand shelter against unuly and disorderly progress.

I can see signs of such tendencies in both professions. Yours is scornful of, and militant against new schools of thought sometimes. Usually it is right. The lawyers when organized are hostile to new political adventures which disturb the certainty and order which the jurist is trained to value and to nourish. Usually the lawyers are right. But in neither case are the professions infallible and power is not likely to make us more tolerant.

The numbers employed in both professions will probably be fewer in proportion to the population. Today in America the numbers are practically equal in the medical and legal professions. Easy entrance and loose organization of a trade are always accompanied by the maintenance of a marginal circumference of people half in and half out of a profession, made up of weak competitors—weak for various reasons, not always efficiency. Guilds and labor unions have always been inclined to limit enrolment, restrict the number of apprentices and draw sharply the lines of membership. These impulses have been strong in both legal and medical professions during recent economic stresses.

It would seem probable that the professions would develop orders and grades within their own membership. The legal profession, in England, to illustrate, has been for centuries highly organized and sometimes extravagantly self-regulating. It has exhibited characteristically

a series of military grades and whenever the lawyers get complete possession they create more grades. The solicitors and barristers are two separate classes in England. Within the class of barristers we had at one time the sergeant. You remember Sergeant Buzfuz in Dickens. The "King's Counsel", the "benchers," and "outer" and "inner barristers" are all grades. These instances are cited only to show how gradations spring up when a trade or a craft becomes highly organized. So far this tendency is not evident in the American bar, but I think there are signs of it in medicine.

The augmented standards of training and their consequences, that is to greater organization, to smaller numbers, to the possibility of graded levels within each profession, if such should eventuate, are all phenomena recognizable elsewhere in our modern world and in other occupations. Plumbers and barbers, accountants, and engineers, even the cousins of our medico-legal brotherhood the ministers and the teachers, show in various forms all the tendencies that I have been referring to as possible in our own affairs. In each of them the level of formal education has steadily risen in the last century. In each of them there is more of a tendency to increased organization. In each there is an urge for better workmanship and sterner ethical requirements, exactly the kind of thing that dominates the doctor and lawyer today.

Another tendency may be to shop or group practice. The doctor and lawyer have had more independent callings and less of the shop organization, or of the institutional structure than any walk in life perhaps. Only the cultural arts like literature and the stage and painting have been so reliant as the doctor and lawyer have on individual effort. Our closest relatives, the church men and the teachers, however, have for centuries been marked by cooperative labor, or what we might call shop practice. The independent minister is a rarity, the independent teacher scarcely exists. The church and the school, the monastery and the university are the background in the life and work of both of these ancient and learned vocations.

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Of all the organized crafts in history, only the doctor and the lawyer have done their work so to speak, on the principle of the human unit, two arms, two legs, and one head. Even in the great guild organizations of classic Greece and Rome, and again in the medieval period, the doctor and the lawyer remained on the whole, solitary craftsmen. The reason is a little illusive. Consultation between several men has been as usual in jurisprudence and the healing arts as it has been in making kettles, or in teaching, or in engineering, or in any craft. Indeed, it is more common and more fruitful than in most affairs.

The tools of the doctor, his herbs and his utensils, like the tools of the lawyer, his books, have been expensive, more expensive than in most crafts, and they are as jointly usable as in any other craft. Why do we not more readily turn to what I call cooperative or shop practice? Perhaps the very vagueness of the arts of health and justice, their very lack of precision or of ease of evaluation, are the secret of the long maintained individualism of the two practitioners. However this may be, there are signs that the institution, the group method of work, the shop, to put it abruptly, is finding a foothold at last in both medicine and law.

In the last two centuries, to turn again to my own profession for illustration, the British solicitor or office lawyer has established the cooperative work shop on a large scale. The metropolitan law office in this country, with a dozen partners, two dozen law clerks and a swarm of stenographers and mechanical and clerical employees is clearly an institution, a shop. On the public side in my own profession large aggregations of lawyers have been assembled in bureaus and prosecutors' staffs. It is nonsense to pretend these men live the life of the old individual lawyer. In a field somewhat intermediate, there are great professional groups which are assembled for railroads, banks, and other enterprises.

Today perhaps half of the American lawyers are working in some sort of institutional structure. They are no longer individuals. They are cogs in a machine. This is new.

It is newer, indeed, than most lawyers have recognized. It is a product in part of machine civilization, and in part of condensed populations, where streets of custom and market places for skill must be set up lest men know not where to buy. And in part, it is a product of specialization, which specialization is brought about by accumulation of ideas and routines in the form of complex laws. It is not a product of the growth of science because there has been no growth of science in the law, but it is clearly influenced by growth of formulas.

We turn to medicine. I need only remind you the same development as well you know, impends there. The hospital, the dispensary, the medical group rise before our inquiring eyes. The hospital has become the theater not only for most treatment that is not trivial but for much of diagnosis. Many laboratory technicians live and have their being under one roof. Many practitioners are free swimmers only in the sense they move from roof to roof, from one hospital to another in the course of the day. The hospital is the consequence chiefly of the machine. It seems to me its benefits are probably cleanliness, light, water, communications and tools, all machine products. Concentration of population makes its expense bearable and its accessibility a treasure. The medical group is another product of similar forces, fumbling its way in this and other countries, but getting here and there a foothold. It is a product again, of the accumulation of knowledge in part, but chiefly the accumulation of routines, of skills with machines. The public health service now richly amplified is a governmental form of the same tendency to group work.

It is not state medicine so much discussed in recent years that threatens the medical profession. It is institutional medicine, in which the state is only a provider of funds at most. The state if carried much further will not be a state in our present sense at all, but only an aggregate of innumerable feudal institutions, as unmanageable, as decentralized as society itself. The surest outcome of the extension of governmental activity is the destruction of



the state itself in the terms in which we think of it at present

These speculations, or observations, or whatever you will, these day dreams, if you like, all lead in the end to emphasizing the drift in this country to a guild form of life and work in both the medical and legal professions. The drift is part of a wide public tendency to more complete social organization. The politician is in essence nothing but a man ambitious for power and prestige. He has been spreading his sails in this breeze and offering the coercion which the government alone has easy at hand to carry us forward in the direction that public sentiment seems to want us to travel. I doubt if the politician has much to offer, or the government which he controls. The defects and abuses of political machinery are too well demonstrated in experience to justify much reliance on their use.

It seems likely to me if the path of a more ordered and regulated life in labor and business and our professions is to be our way of trying to carry forward the world, then it will take the form of self regulation, within the boundaries of the crafts themselves, as I have indicated, much more readily and, in the end, more effectively and permanently than through dictation by society as a whole. The effect of the guild, of the group, of the craft, of the class is more impressive than that of the state all through history. In the guild, and there only, it seems, are technical experience and common motives and persistence of purpose sufficiently focused to be effective. The state with its weapons of coercion, the bullet and the prison, is dramatic always, but is effective only in spasmodic form. The motives of the state are transient, its gaze wanders, its processes are easily corrupted. The motives of a craft or a profession are exactly the contrary.

To approach the prospect from the angle of another inquiry one wonders how much this process of crystallization in the profession will reduce its initiative, its adventure, its glamor, so to speak. Are the doctor and lawyer to become mere formalists nestling into the security of high walled societies, drilled in the dogmas by long formal train-

ing, bound and hedged by the prodigious accumulation of their own information and routines, imprisoned by the very heap of tools they have invented? In such case society will surely suffer. Learning will grow sluggish. Science will be smug and content with answering questions and asking none of itself. The adventurous and imaginative minds would turn away from enlistment in orders whose priests are worshipping in these creeds outworn. The threat is real, but I am not much alarmed.

There is always a frontier in the continent of human arts and sciences. Day after day we see what was yesterday an innovation, an adventure, an experiment, reduced to a mere technique which can be taught to any student. Only last week diagnosis by X-ray and the operation of appendicitis were marvels of individual skill, and today the patterns in both are made to a large degree at least for the simpler cases. A few years ago in my own field the income tax and the field of corporate reorganization (to deal with techniques which you do not know, but which again give us examples) were subjects which the average lawyer looked upon with bewilderment. Today the accountant has taken over most of the first topic, reduced to routine, and the second is being taught in law schools.

This process of reducing adventure to familiar patterns goes on so steadily in both professions that it seems to every generation of us as if the skills we had toiled to obtain were unprofitable in our hands. No form of guild control seems ever to have checked the merchant who sought new seas to traffic in, or new markets to create. Such is the case on even a wider scale in the great unexplored professions, whose frontiers are so little advanced as are those that deal with public health, and even more with public order.

In facing, therefore, a regime of vastly greater organization in both professions, we can, I think, welcome some great advantages, be mindful of the pitfalls, but go forward undismayed. The opportunity for imagination and initiative and industry and the seeing eye will be little affected. The great rewards will still go to the brave and

the wise We have been talking these latter years out of all proper emphasis The opportunity for human welfare afforded by planning and organization and social forethought and coercion have been exaggerated If, as, and when, in the lawyer's phrase, you doctors take control of procreation and proceed to plan a brave new world by handling the breeding of men, as you have handled the breeding of fruit flies, you may transform the species, and so alter the factors in the formulae But, if so, you must change the scientific name of the animal I am dealing with a swarm called *homo sapiens* While that species survives and breeds its young, the profession of medicine and the profession of the law seem to me likely still to offer, as they have done of old, the same magnificent career for the individual who dares



# NINTH ANNUAL GRADUATE FORTNIGHT

## "Trauma; Occupational Diseases and Hazards"

### October 19 to 31, 1936

#### THE MEDICAL PROBLEM IN FIRST AID\*

ROBERT H. KENNEDY

The proper care of persons sustaining injuries in accidents is one of the greatest public health problems of the present day. We have been awakening to the magnitude of the annual accident toll only in the past few years. Thus far the general public is probably better informed and more interested and aroused than is the general medical profession. The "Principles of Medical Ethics" of the American Medical Association, Chapter IV, Section 1, states "Physicians, as good citizens and because their training specially qualifies them to render this service, should give advice concerning the public health of the community." Greater knowledge of the first aid problem is necessary in order to conform to the principles and ideals of our profession.

According to the latest report of the National Safety Council 100,000 American lives were lost through accident in 1935. In addition, 9,340,000 people sustained non-fatal injuries. That is, one out of every fourteen persons in the United States was hurt in an accident last year. The odds seem rather large in favor of some of us being among this group in the coming year. The estimated cost of these accidents is \$9,500,000 each day during last year, a total of \$3,450,000,000.

The dangerous spots as far as death is concerned are in order, first, motor vehicle accidents, second, the home and third, public accidents which include drownings, burns, falls, heat prostration, freezing, railroad, firearms and poisoning. Only following these do occupational accidents appear, making up less than half the number of traffic deaths. Among these there are more farm deaths than in any other classification of employment.

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\* Delivered October 21, 1936

The order is somewhat different for permanently disabling accidents,—being as follows, the home, the automobile, occupation, public accidents. The order is still different for those temporarily disabled,—the home, public accidents, occupation, the automobile. It is important to note that, in the comparative danger of these three types of results of accident, the home takes first place twice and second place once, while occupational hazard stands in last place once and third place twice.

The National Safety Council and similar organizations are exerting tremendous effort and spending large sums of money in educating the public in accident prevention. Results are evident in reducing the accident frequency rate, although the gross number continues to increase. It appears that for many years to come accidents will constitute a severe personal and economic loss.

Some of the deaths and some of the permanent disability may be prevented by prompt, efficient first aid. The morbidity may be diminished considerably by the same means. The initial care at the site of accident has always been, is, and always will be, rendered usually by lay persons. With nearly ten million accidents a year we cannot expect a physician to be present where they occur, or to arrive before something is done, in the majority of instances. Many times this initial care will be the deciding factor between life or death, between permanent or temporary disability, between prolonged hospital care and loss of time or no disability. Many times treatment given by a physician at office or hospital cannot undo the lack of care, or the improper rendering of it, at the site of accident. As physicians we should know the most approved methods of first aid, not only because we might occasionally be called on to render it ourselves, but largely because we should be able to direct the methods of lay training in proper channels.

It is notable that there has been considerable objection from members of the medical profession to laymen being trained to render first aid. Some apparently believe that knowledge of this subject by the layman will keep practice

away from the doctor. We must remember that in instruction, first aid is uniformly defined as the temporary assistance rendered a sufferer until the arrival of medical aid. There is no intention or desire that it be a substitute for medical treatment. Others apparently think that lay first aid may do more harm to the injured person. For bystanders to do something in case of accident is an evidence of natural sympathy. Even the lower animals crowd around an injured mate and express their sympathy or give their aid. How much better it is to have aid rendered by someone with even a little knowledge and training than by one in absolute ignorance of the first principles, since something will be done anyway. Cooperation of the medical profession in lay first aid instruction should exist, rather than bringing arguments against it.

There has been no organized effort to train the medical profession in first aid. The medical schools which give any instruction in this subject are a rare exception. The result is that the average medical student on receiving his degree knows less about it than a first class Boy Scout. If he takes an internship in a hospital with an ambulance service, if he becomes an industrial, mine, railroad or police surgeon he may become interested. But in most instances these activities are soon shunted to the side line and his interest wanes. The rank and file of the profession consider the subject outside their field or are not aware of its extent and importance. The prime movers in first aid instruction have therefore come from the lay public, aided by an occasional physician. Many different books of instruction have been published, sometimes advocating diametrically opposed methods of care. The content is often criticized by physicians, sometimes justly, but frequently without sufficient practical experience to appreciate why certain items have to be included. Improved forms of treatment are adopted by the medical profession, but may not be incorporated in first aid books for years, because the profession did not know how to place them before a layman practically. In other instances first aid workers have devised improved methods which have not

been adopted generally by the medical profession, because of lack of close contact with the work. Much is to be gained in the care of the injured by closer cooperation between these two groups to their mutual advantage.

A history of the development of first aid does not seem to have been written and the piecemeal evidence of its early existence is unsatisfactory. Many of the miracles of the Bible were probably examples of sensible first aid. In the seventeenth chapter of the First Book of Kings we find an early instance of resuscitation. Elijah lived about 900 B. C. and this was performed by him on the son of the widow of Zarephath. He "fell sick, and his sickness was so sore, that there was no breath left in him." Elijah laid the child upon his own bed. "He stretched himself upon the child three times, and cried unto the Lord." "He revived." This seems to be a forerunner of the modern methods of artificial respiration, possibly the Sylvester method.

War has been a major occupation of the peoples of the earth from earliest known history. Literature is filled with its gruesome details, but there is little reference to affording any means of relief for the wounded, probably because it was usually non-existent. It is likely that the first practitioners of the art of healing in common life were women. The first surgeons were doubtless warriors to whom aptitude or experience gave special skill in treating wounds. Livy tells that after a battle with the Etrurians in the fifth century B. C. the Roman general distributed the wounded among the patricians. Xenophon in his "Retreat of the Ten Thousand" says that after the battle of Cunaxa, about 400 B. C. he appointed eight doctors because there were many wounded. His manner of stating it indicates that they were selected from the other soldiers.

Alexander was accompanied in his march of conquest by the most famous physicians of his age, one of whom extracted an arrow from his shoulder, and another showed great nerve and skill in cutting the barbed head of a javelin from the conqueror's breast. When Ptolemy Philo

meter received a fracture of the skull in battle, 146 B C, the surgeons immediately performed the operation of trepanning. Such references are the exception and apparently the general practice was to leave the wounded to die or to recover as best they could with no prearranged plan to care for them.

"At no time during the Middle Ages, or even during the Renaissance did physicians undertake any surgical work." "Even as late as the 11th century the armies had no surgeons."

The St. John Ambulance Association of England may be called the oldest first aid association in the world, originating in 1048 during the Crusades. However, as far as actual work was concerned it really lay dormant for several centuries to be revived in its present form in 1877. It now has thousands of branches in England and scores in Canada. For the most part, even in Ambrose Paré's time, "wounded common soldiers were left to the ministrations of their companions in arms or to the camp followers." Many were killed if they were suffering too much. The nobility in the 16th century brought their own surgeons to war. Paré was originally a barber surgeon and as chief surgeon to King Henry II, saw his first army service at the Battle of Turin in 1537.

The first official sanitary service, foundation of the present army medical service, was created only about three centuries ago. For the first time first aid in war began to be handled through medical organizations to any extent. The layman gladly shifted this responsibility, for which he was not trained, to the military man. But military hospital and relief work left much to be desired and laymen continued to assist. In 1813, during the Napoleonic wars the ladies of Frankfort united to found the *Frauenvereine* of that city. Its express object was to insure "more complete arrangements for the care of the sick and wounded, and to assist in providing for the wants of the military hospitals of Frankfort without distinction of friend or foe." This organization existed for at least seventy years and may still be active.



The public press was largely responsible for bringing before the English people the entire inadequacy of her medical field service in the Crimean War of 1854. As a result Florence Nightingale and her forty women helpers became a civil volunteer corps in the Crimea. They showed the world what military hospitals ought to be.

Within a month of the start of our Civil War our own medical and hospital field service was found distressingly inadequate. Laymen organized the Sanitary Commission which required many months before it could obtain official recognition. Gradually it grew, supported by committees all through the North, until "its huge four-horse wagons were galloped and halted on the very edge of battle, men sprang from them and, through the thickest of the fight, bore their rescued, wounded men to a place of safety and care provided for them." Clara Barton says "It is probable that no other act of our country ever won for it the amount of moral credit and respect from other nations which has resulted from this unparalleled display of active humanity." The Sanitary Commission ceased to exist shortly after the Civil War. In all the wars of that time unofficial relief was found necessary but the efforts were sporadic and short lived.

In 1859 a Swiss gentleman, Monsieur Dunant, while traveling in Italy, happened to be in the neighborhood of Solferino on the day of the great battle, the 24th of June. He was impressed by the sufferings on the battle field and in the hospitals where he remained to assist as a volunteer. In 1862 he published a description of what he had seen under the title "Un Souvenir de Solferino" and proposed the founding in every country of permanent societies for the relief of the wounded. This led to an international conference held at Geneva in October 1863 and attended by delegates from sixteen European governments. Plans were made for establishing central relief committees in each country. A second congress was held in August 1864, the delegates having been accredited by their governments with sufficient power to sign a treaty. One was prepared providing for the neutrality and security of hos-

pitals and persons employed in them even after the enemy had occupied the ground, that field hospitals should not be subject to capture, military protection for civilians who cared for wounded in their homes, requisite care and treatment for wounded prisoners, a flag for hospitals and convoys and an arm badge for persons. The design was a red cross upon a white ground. This was a compliment to the country in which the congress was sitting, this being the national flag of Switzerland with the colors reversed—her flag being a white cross on a red ground. This general treaty was signed by twelve governments at first,—a remarkable tribute to the efforts of one individual in private life. His accomplishment was later recognized when in 1901 one-half of the first Nobel Peace Prize was awarded to Monsieur Jean Henri Dunant. The organization was known as the International Committee for Aid to the Military Wounded. It was not long before its tremendous value was proved in the Franco-Prussian War of 1870.

The United States was officially represented at both the Conference of 1863 and the Congress of 1864 but our government declined to sign the treaty on the ground that we were in the midst of war. Sporadic efforts were made to obtain its adoption up to 1877 when Miss Clara Barton headed a committee for this purpose. She had been through the Civil War with the Sanitary Commission, and through the Franco-Prussian War working with the Red Cross committees. In the latter she saw the Red Cross accomplish in four months what we had failed to accomplish in four years of civil war without it. She determined to try to make the American people understand the Red Cross and the treaty. She made an official presentation to President Hayes in 1877 and worked doggedly until the treaty was finally proclaimed by President Arthur on July 26, 1882. We were the 32nd nation to sign the treaty, the last civilized nation of that time. But we were the first to add to the scope of the organization, in addition to the relief of sufferings by war, those by "pestilence, famine, fire, flood, and other calamities, so great as to be regarded as national

in extent" Miss Barton was elected the first president of the American Association of the Red Cross

Methods of organized first aid were developed largely in war experience, but its use in civil life has continued to be stressed more largely, until this now occupies possibly the major place. The first society devoted expressly to aiding in the recovering of drowning persons was established at Amsterdam in 1767. The Italian States followed in 1768 and the city of Paris in 1772. At London in 1774 was founded the Royal Humane Society. Its purpose was to "restore animation suspended by the effects of water, cold, convulsions, noxious vapors and lightning" and to prevent accidents at sea. The Life Saving Service of the City of New York is a volunteer organization established fifty years ago and still active.

Various organizations were started with first aid purposes, but most of them appear to have declined rapidly after the passing of their founders. In New York the Society for Instruction in First Aid to the Injured was founded in 1884. "Our object is clearly defined, we would aid those who have sustained bodily injury, would make them comfortable, and save life and limb, if possible, during that trying period when the physician is being sought for, perhaps in vain." From its list of officers it was apparently a lay organization with a Medical Director. Several editions of a first aid handbook were prepared. In the past twenty years its work has been taken over largely by the Red Cross.

The National Volunteer Emergency Service was incorporated in New York in 1900 by four doctors and twenty three laymen, twelve of whom were ministers. It had a complete military set up from major-generals down with uniforms and purchased commissions. Its aims were theoretically good but from the last publication, which I found, dated 1908, it seemed to have accomplished little and apparently disappeared.

On February 9, 1903 a department known as "First Aid to the Injured" was established in the American National Red Cross. A section was added to the By-Laws, Dec 8,

1903 which provided for its permanent operation,—the formation of classes of instruction in first aid, methods of treatment of the injured and other necessary provisions. Mr. Edward Howe, a member of the St. John Ambulance Association of England, was made superintendent of the new department.

The American Red Cross passed through a drastic reorganization during 1904. Clara Barton resigned as president after twenty-two years' service and the First Aid Department was discontinued. However it was reestablished in 1908.

The New England First Aid Association was organized in Boston, November 17, 1904. Classes of instruction were formed in police and fire departments, railroads, clubs and societies, including the Y M C A. Six months' work showed that it was spreading rapidly over the whole country and the National First Aid Association of America was incorporated April 18, 1905. The founders seem to have been chiefly laymen. Miss Barton was elected president. Various local and state first aid societies associated themselves with it. The first city to accept this work in its schools and operate a first aid class among its teachers was the city of Everett, Mass. in 1907. The first corporation to see the great possibilities in giving their employees first aid instruction was the Simonds Manufacturing Co., at Fitchburg, Mass. From its annual reports this organization seems to have accomplished much in its first few years. However following the death of Miss Barton in 1912, when over ninety years of age, we find little record of it, although a magazine was published at least up until 1924.

Meanwhile after the First Aid Department had been discontinued by the American Red Cross in 1904, Mr. Edward Howe, who had been brought from England to supervise it, went to Chicago. Here he organized the American White Cross First Aid Society. Its objects were "A national system of education in principles and methods of first aid emergency treatment of those injured by accident and organization of ambulance brigades and nursing corps for volunteer service." It does not seem

to have survived long but is interesting because on its board of directors were Frank Billings, J B Herrick, Nicholas Senn and John B Murphy Its Surgeon-in-Chief was Nicholas Senn

The Pennsylvania Railroad commenced first aid on its lines in 1904 It installed a package of sterile dressings and stretchers in baggage cars, stations, shops, etc Wooden splints were also added in some places

The American Red Cross returned to this work in 1908 and in a few years became the recognized leader in the field of organizing and training in first aid President William H Taft said in 1909 that the Red Cross should "proceed with the organization of instruction in precaution against accident and first aid among the miners, railroad men, industrial employees, firemen, policemen, sailors, school teachers and the people generally" Major Charles Lynch, Medical Corps, U S Army, was detailed in 1909 by the Secretary of War to have charge of first aid for the Red Cross In the previous year he had prepared a text-book on first aid for them This went through a number of editions, including industrial, miners', police and firemen's, railroad, and women's It was translated into many languages including Italian, Slovak, Polish, Lithuanian, Spanish, Portuguese and Chinese In 1910 the Pullman Palace Car Company presented to the Red Cross a completely equipped first aid railway car from which instruction could be carried on along all main line railroads This was devoted primarily to teaching first aid to railroad employees, but other people were also given instruction at the various stops By the end of 1911 two cars were in operation and by 1918 over 1,000,000 persons had received instruction through these cars

First aid training had progressed far enough so that at the Ninth International Conference of the Red Cross in 1911 an outdoor exhibition was given by the Army, Navy, Boy Scouts, railway trainmen, firemen and policemen In 1912 a course of instruction was begun for the employees of the Bell Telephone Company of Pennsylvania From this followed the nation wide training of telephone per

sonnel which exists at present Also in 1912 a first aid motion picture film was produced by the Edison Company In 1914 water first aid (life saving service) was inaugurated

In 1915 courses of instruction in first aid were commenced among employees of the logging camps and saw mills in the State of Washington In 1916 a start was made in adding the limestone, sandstone, slate, marble and granite quarries of the United States to this work In 1920 intensified instruction was commenced in schools and colleges, and among policemen and firemen, soldiers and sailors, and state departments of labor and industry Between 1910 and 1922, 164,121 persons completed a first aid course and received a Red Cross Certificate In 1923 forest rangers and employees on reclamation projects were added to the groups instructed In the fiscal year ending June 30, 1936, 222,693 First Aid Certificates were issued The courses were taught by 9,662 instructors, 6,490 of whom were lay instructors and 3,172 were professional or doctors of medicine Over 1,170,000 certificates have been issued since 1910

In 1935 two campaigns were started,—one against Home and Farm Accidents and the other for Highway Emergency First Aid Stations The ideal of the latter is to help in the problem of motor accidents along rural highways The individual stations are under supervision of the local Red Cross Chapters After sixteen months' effort on October 1, 1936 there were 1149 stations in operation in 47 states, 3466 more stations had been definitely promised by the chapters The chief delay in these is obtaining trained personnel The Red Cross has requested the assistance of the medical profession in training this personnel In many places this cooperation has been obtained with difficulty, if at all Fixed traction splints are part of the equipment and inasmuch as the Red Cross commenced to train its instructors in this only three years ago, the help of the medical profession is needed badly The major difficulty is that so many of the medical profession know nothing about it

In 1936 a plan for Mobile Emergency First Aid Units was issued and it is expected that some of these will be in operation soon. A unit will consist of one or more men attached to a work truck, automobile or motor cycle in connection with their regular employment and who have been trained in Red Cross First Aid. They must have the permission of their organization to give emergency first aid care to the victims of highway accidents as they may come upon them in the course of their regular duties. This will concern particularly state police and state highway departments and public utility companies. They have no direct connection with the fixed Highway Emergency First Aid stations but will supplement their work in first aid without transportation.

Instruction in first aid is given by the United States Army, Navy and Coast Guard Service to its personnel. As a result of the proved efficiency and value of the Red Cross training it is also given by the following organizations, among others:

- U S Public Health Service
- U S Bureau of Mines
- American Red Cross
- National Safety Council
- Boy Scouts
- Girl Scouts
- American Public Health Association
- American Railway Association
- American Gas Association
- American Petroleum Institute
- Edison Electric Institute
- Many individual industries
- State and local police departments
- Fire departments

The National Safety Council was organized in 1913. Its efforts have been directed particularly toward accident prevention, where it has rendered outstanding service. It has also contributed considerably to first aid work by showing the gravity of the problem through its gathering and publishing of accident statistics, in most striking form,

by the publication and distribution to its members of about one hundred different pamphlets, by encouraging first aid training, as given by the American Red Cross and the United States Bureau of Mines, throughout all industry, and offering medals as awards in local, state and national first aid contests. It also awards a President's Medal to anyone who successfully applies the Schafer-Priene Pressure method of resuscitation in any emergency.

In this country education of the miners in first aid was first taken up systematically in the Pennsylvania anthracite mining district at Jermy, Pa. in 1899, later spreading to Alabama and Indiana. When the Bureau of Mines of the Department of the Interior began its nation wide campaign of instructing miners in the use of mine rescue apparatus and in methods of first aid (about 1913) the American Red Cross turned over that part of its industrial training work to the Bureau of Mines. This had been carried to a high point of efficiency by Dr. M. J. Shields since 1909. This arrangement has been continued since, the Red Cross cooperating in the preparation of first aid manuals in 1916 and 1921. Up to September 1, 1929, approximately 395,000 men had been instructed in these methods. The latest revision of the Manual of First Aid Instruction was made in 1930 entirely by first aid instructors and surgeons connected with the Bureau of Mines, with the idea of standardizing the methods for all industries it serves. The Bureau of Mines maintains eleven mine safety stations in stationary buildings and eleven in movable rescue cars. These are located in nineteen states and each has a first aid instructor to give training and demonstration.

The Boy Scouts of America, with a present membership of over one million, have an important place in first aid instruction in this for Scouts and Scout leaders was commenced in 1910. Cooperation with the Red Cross has been maintained since that time. Knowledge of elementary first aid is one of the requirements to become a Second Class Scout. The extent of this training must be considerably widened before one may become a First Class Scout.



One cannot attain to the rank of Life Scout or Eagle Scout unless one has qualified for a certain number of merit badges. In each case one of these must be a merit badge in first aid. Between 1911 and August 1936 over 275,000 merit badges in first aid were awarded. There is also an advanced course in first aid which has been taken by 1488 scout leaders during the past five years. It is stated authoritatively that the number of instances in which first aid training is put to practical use by Boy Scouts runs very high. Every troop is urged to have on hand a set of fixed traction splints for instruction and emergency purposes.

Recently the American Relief Administration Children's Fund, Inc., has made available to the Boy Scouts a sum of money to be used over a five year period for the aggressive promotion of the Boy Scout health and safety program. First aid instruction has a prominent place in their five year objective.

The Girl Scouts, with a membership of over 300,000 also give good first aid instruction. The Red Cross has supervised their work since 1913.

I wish to call your attention to a few recognized first aid methods, as examples, about which some practitioners might know more with advantage. The Prone Pressure Method of artificial respiration was brought out by Sir Edward Sharpey Schafer in 1903. A standard technique of applying it was approved in 1927 by the American Gas Association, American Red Cross, American Telephone and Telegraph Company, Bethlehem Steel Corporation, National Electric Light Association, National Safety Council, Bureau of Medicine and Surgery, Navy Department, office of the Surgeon General, War Department, U S Bureau of Mines, U S Bureau of Standards, and U S Public Health Service. It is recognized as the most efficient and safest method. Yet one still usually finds it side by side with the Sylvester method in many medical text-books. I would wager that more medical men in this audience have made use of the Sylvester than the Schafer method. Recently there has been added the Holgar-

Nielson method from Denmark Is there any reason why a layman should not ask your opinion of it? I was asked mine and had to admit that I had never heard of it I looked it up and found that I had to depend on laymen to inform me about it It should not be recommended

You are fortunate if you have a text book of surgery which tells you the modern treatment of snake bite Yet if you have ever practiced in the country you have seen patients who have been, or more probably think they have been, bitten by a snake A tourniquet to increase bleeding, a deep cross cut over the fang marks, but then, instead of the application of a caustic, as formerly, suction is continued for at least one half hour with the mouth or a breast pump

The treatment of sunstroke and heat exhaustion are entirely different For us to treat both with cold water or ice may kill one of them First aid men are well aware of this, but I did not get it out of medical school

These are merely examples of methods of care which are better known frequently by the first aider than the doctor The duty of the first-aiders ends where the physician begins It would be unfortunate if we arrived while these treatments were still under way and we were not sufficiently acquainted with them to continue In 1934 drowning caused 7,326 deaths, poisonous gas 1,695, electric shock 723, snake bite 147, and excessive heat 3,250 There are plenty of lives to be saved by both the physician and the first-aiders

The tannic acid method of treating burns was introduced about 1925 by Davidson Anyone who has had opportunity to use it gladly agrees that it has many advantages over any treatment previously used A good result is jeopardized if any kind of grease or ointment is applied first The American Red Cross in the 1933 edition of its Text-Book was already recommending tannic acid in first aid and explaining the folly of greases It will take a long time for the many texts which follow the Red Cross to be changed and still longer for the idea to reach the public generally Sometimes I think that the period is even longer

before a new, but admittedly correct, idea is adopted by the majority of the medical profession. The first-aid is anxious for our advice as to new and improved methods if we can make them practical. The layman wishes to bring the injured to the physician in better condition for the doctor's treatment. It is unfortunate that so few physicians have maintained an interest in first aid methods that hardly any of our profession are really of value even in a consulting capacity.

Hemorrhage and fractures are the most important two conditions which confront the first aider. Of these, fractures are many times more frequent, probably occurring about a million and a half times a year in this country.

In major fractures the initial care given at the place of accident and the method of transportation influence the ultimate good or poor result. Death, permanent disability, loss of earning power and dependence on the community may be the price of lack of knowledge of, or attention to, the necessary details of what should be done at this critical time.

At the instant a bone is broken, nature tries to protect the part from more injury. If there is any displacement of the fragments the muscles shorten causing the fragments to ride by one another resulting in the only possible natural splinting. Such splinting is fairly effective while the part is at rest, but does not offer sufficient protection while moving the part or the patient. At the time of the original injury, or as a result of overriding of the fragments, the surrounding soft parts are damaged as well as the bone. The soft parts concerned are periosteum, muscle, blood vessels, nerves, connective tissue and fat. In transporting without effective splinting the fragments are liable to be moved about causing more, often irreparable, damage to the soft parts. Not only may large blood vessels or nerves be torn but such motion causes pain, with its resultant increase in shock. Moreover in compound fractures motion of the fragments adds the risk of spreading infection through tissues not exposed to infection at the time of the original trauma.

A bone may be broken in an accident and no displacement of the fragments occur. Suppose a person is allowed to bear weight on such an injured leg or to be moved without the proper splinting, displacement of bone fragments may occur and any of the unfortunate results mentioned above may follow. Not infrequently a closed fracture will become compound, making the result as to life, limb and permanent disability much more serious than if the fracture had remained closed.

All of these occurrences can be prevented if sufficient pull is applied to the part to overcome the muscular contraction and thus to preserve the original length of the bone. This is easy if applied immediately after injury before the muscles have had an opportunity to become fixed in spasm. Early reduction is facilitated and the length of disability in such cases is decreased. Late reductions are lamentable and difficult and are often followed by long disability.

The advantages of proper transportation are

- 1 For the patient it decreases the danger of further injury, increases comfort and lessens shock

- 2 For the surgeon it simplifies reduction

- 3 For the hospital as well as the patient it shortens his stay by promoting earlier union and lessening the danger of non-union

- 4 From the economic side, the expense to industry is diminished because the injured man spends fewer days in the hospital and returns to work more quickly

The majority of the ambulances going to the place of accident are manned by laymen. Since most of the initial care will be rendered by lay persons the physician must be acquainted with the best methods in order to guide the general policy and instruct individuals. Since the injured will usually be seen first by the physician at office or hospital, the physician should arrange in his community that approved methods of care and transportation are employed in order to obtain the best result in the least time. This initial care will continue to be rendered by the lay public. It does not constitute treatment, but if properly given

will make the professional treatment simple and more effective. There can be no clash of interest between the physician and the lay public in this matter.

### Principles of Initial Care

1. If suspicious that a fracture is present, render care as a fracture
2. Combat any shock
3. Avoid all unnecessary handling
4. Protect any existing wound by the best means available
5. Splint effectively, wherever found, before transporting
6. Transport carefully.

The injured person should first be examined rapidly and gently to determine whether he is seriously hurt. The clothing does not need to be removed. In examining an injured person keep him thoroughly covered except the part actually being examined. One should depend on local pain, loss of function, deformity and malposition of the limb for the emergency diagnosis of fracture and should not try to obtain crepitus or false point of motion. If the patient thinks that he felt a bone "snap," for emergency purposes, we should be satisfied with his history and not attempt to prove the diagnosis on the street.

The saving of life comes first, the saving of limb second. If the patient is in severe shock this demands treatment before anything is done for the injured limb. There is no use in splinting a limb carefully while neglecting to treat shock from which the patient may be dying. On the other hand traction on an extremity may be an effective means of combating shock. If a physician is present morphine is the best treatment for shock. Sufficient morphine should be given to relieve pain and thereby quiet the patient's restlessness. The body heat must be maintained by sufficient extra covering and the use of external heat.

If a wound is suspected, the seams of the clothing are split to expose the region. If a wound is found, which may possibly connect with a fracture, it should not be washed out. Fresh mild tincture of iodine, if available, may be

applied to the surrounding skin and projecting bone. This should not be applied to exposed soft parts, unless of small extent, since it causes pain. A sterile compress should then be placed over the wound. Bleeding should be stopped. It is rare that this cannot be done with a firm compression bandage.

Tourniquets should not be used until compression of the wound has proved of no avail. Deaths have been caused by an improperly applied tourniquet which allows some arterial blood to enter the part and only shuts off the venous return. It is common to see all bleeding stop as soon as a tourniquet is removed.

If a tourniquet must be used it should be loosened every half hour to allow blood to return to the part distal to the tourniquet. If a tourniquet is applied too tightly or for too long a period gangrene, paralysis from nerve pressure, or lowered resistance to infection may result.

Do not attempt to replace the fragments in a compound fracture with projecting bone. If the bone disappears beneath the skin in the course of the application of traction, this should not cause anxiety. The patient must be operated on in any case to clean the wound. It is important to have word accompany the patient that the bone has been exposed in order to guide the physician treating the patient. Traction is more necessary in compound than in closed fractures, to lessen the danger of spreading contamination in the soft parts and to diminish the greater shock.

The patient should not be picked up hastily and dumped into the first automobile and rushed to a doctor's office or hospital. It is far better to cover him adequately and let him lie on the ground where he was found, until splints can be put on, and then move him in an ambulance. If it is necessary to change his position at all before splinting, in the instance of an extremity fracture, a continuous pull should be exerted by hand on the injured part while he is being moved.

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The only effective and advisable method for transporting patients with fractures of the long bones of either upper

or lower extremities is in some form of fixed traction. This requires the use of a splint of the Thomas type. Fixed traction is that in which the pull is exerted from fixed points above and below the fracture so that the pull remains the same whatever the position of limb or splint. Overriding is characteristic of these fractures and there can be no generally effective immobilization without traction. In addition traction relieves pain and shock and prevents further damage in transportation. The fixed traction splint should be applied if there is any possibility of fracture between the hip joint and the foot or between the shoulder joint and the middle of the forearm, no matter whether the injuries are closed or compound.

The full ring Thomas splint can be used on either upper or lower extremity. More generally applicable and advisable splints of the Thomas type are the Murray-Jones hinged arm splint for the upper extremity and the Keller-Blake hinged half-ring splint for the lower extremity. These splints should be applied wherever the patient is found before moving him.

There are certain standards that are necessary in the application of this general method. It does not make any difference what particular procedure is used so long as one appreciates what it is sought to accomplish.

In the use of traction there are six requirements:

1. There must be some adequate form of hitch, and it is necessary to protect the part beneath the hitch so that it will not be injured.

2. The application of a traction hitch above the ankle or the wrist.

3. There must be some means of increasing traction so that the desired pull is obtained.

4. The extremity being in traction, it must be supported from below. One must not depend merely on traction for the entire support of the limb.

5. Lateral movements must be prevented.

6. The whole splint must be suspended in such manner that the heel will never be pressed upon.

In hospital practice a traction splint should be applied immediately in the emergency room, if it has not been done before. The patient is transported to the X ray room and ward with traction on. The removal of the patient's clothes is supervised so that if splint traction has temporarily to be loosened traction is maintained manually until splint traction can be reapplied. The traction splint is kept on during the trip to the operating room and until the patient is in the care of a surgeon.

If the mechanism of injury is such that a fracture of the spine might have been produced, transport as a fracture, even though no objective signs are made out in a cursory examination. Death or permanent disability result more commonly from improper transportation of fracture of the spine, sometimes unrecognized, than from any other injury. Pinching the skin and tying slight active motions of the extremities from below upward will determine rapidly whether or not there is marked cord injury.

In patients with possible fractures of the dorsal or lumbar regions the underlying principle of hyperextension should be observed in any moving and in transferring them from the site of accident. If found in any other position, the patient should be slowly and evenly rolled onto his face, with a sheet or blanket beneath him if one is available. If neither of these is handy and two other persons only are present the patient may be moved to the splint with one person lifting the shoulders and the other the thighs, the body being in the face down position. With sheet or blanket available the injured person is carried to the splint in the prone position in the improvised hammock with one person holding the sheet at either end. If three to six competently trained men are present the patient may be lifted with the entire body kept in a straight line without any twisting and placed face downward on the splint. Misdirected attempts to help may cause further damage.

The ideal position for transportation in possible fractures of the dorsal and lumbar regions is face downward on a rigid support. Ordinary stretchers do not answer the purpose, but only those in which the side bars are held

rigidly apart In the absence of this, a wide board or a door may be used The so called "ladder" splint is the simplest and most effective It consists of two long boards fastened together by three cross pieces, either nailed or tied on Each board is padded with a blanket or other material The patient should be carefully tied in position so that jolts will not cause any movement If paralysis is thought to be present all wrinkles in the clothing and hard objects in the pockets should be removed to prevent the patient lying on them with the probability of developing pressure sores later

In possible fractures of the cervical vertebrae the head and trunk should be kept in the same position as found during movement to the rigid stretcher, etc In addition to the usual body ties, rigid support, such as bags of sand should be placed either side of the head to prevent rotation

Miss Clara Barton, first president of the American Association of the Red Cross, said in an address in 1907

"When one shall know, not only how to give, but how to do, and possibly prevent, when every man may understand his wounded brother's need and how to meet it, when the mother shall know how to save her child in accident, when even the child shall be taught to lessen the pain or to save the life of its playmate—then comes the real help

"Think, friends, what it would be,—yes what it will be, when all the rough, sturdy men of danger, living every hour in the face of accident and death, shall know what to do in the moment for his writhing companion in toil, when the homes—the children in the streets and in the schools—shall all possess the knowledge which this method of human beneficence teaches—this is First Aid—this is what it stands for—the lessons which it inculcates and its faithful apostles teach "

In considering "Trauma and Occupational Hazard" it is necessary that we remember the important part played by first aid It behooves us to know at least as much about it as the hundreds of thousands of trained laymen We should take pride in being able to advise them in their methods and cooperate in making new medical treatments

practically available to them. At the same time we must aim to keep the general medical profession abreast of the knowledge gained by experience in first aid work. The initial care of the injured is a tremendous public health problem in which the majority of the medical profession has displayed little interest and exerted almost no influence. Lay organizations are doing excellent work, but they are asking for more assistance from the profession than they have been receiving. Each of us has it within his power to remedy this.

I am grateful for assistance rendered to me in the preparation of this article by Dr Archibald Malloch, Librarian of the New York Academy of Medicine, Mr Harold F Enlows, Director First Aid and Life Saving, American Red Cross, Mr W H Cameron, Managing Director, National Safety Council, Captain Fred C Mills, Director Health and Safety Service, Boy Scouts of America, Dr Hubley R Owen, Chief Surgeon, Department of Public Safety, Philadelphia.

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## 1 ERYTHROBLASTOSIS FETALIS AS A CAUSE OF INFANTILE MORTALITY

CARL T JAVERT

Erythroblastosis caused 5 per cent of the neonatal deaths in 1936 at the Woman's Clinic of the New York Hospital. It is believed that the mortality rate can be lowered by diagnosis in the unborn child, proper management of labor, and prompt treatment.

Blood formation in the embryo was reviewed. Erythroblastosis may be due to a deficiency in the principle necessary for red cell maturation. Pathologically, the prolongation of extra-medullary hemopoiesis must exceed that of premature infants.

Maternal and infantile records of ten cases were presented, including laboratory and autopsy data. The mortality rate was 70 per cent. Treatment consisted of blood transfusions. The three surviving infants received nine, seven, four transfusions respectively. The nucleated red cells disappeared within the first two weeks of life.

The diagnosis was based on the clinical picture and the presence of erythroblasts in the blood smear, and in the fetal vessels of the placenta. Prematurity, sepsis, congenital syphilis, hemorrhagic disease, intracranial hemorrhage, congenital heart disease, malformation of the biliary system, aplastic anemia, and leukemia were ruled out.

Erythroblastosis runs part of its course intra-utero. Students of neonatology can base a presumptive diagnosis on the racial aspects, familial jaundice, hydramnios, diminished or absent fetal activity, fetal distress, and amber colored amniotic fluid.

## 2 PREVENTION AND CONTROL OF PUERPERAL INFECTION DUE TO THE BETA HEMOLYTIC STREPTOCOCCUS\*

R GORDON DOUGLAS

A resume of measures preventing all kinds of puerperal infections should include the following:

Strictest possible aseptic surgical technique, limitation of pelvic examinations and operative interference, improvement of the general condition of the patient and employment of prophylactic transfusions when indicated.

The most common source of Group A hemolytic streptococci is the upper respiratory passages. It has also been found that these organisms are frequently present during acute follicular tonsillitis and scarlatina.

\* This paper will be published in the February number of the *American Journal of Surgery*.

Their frequency is also increased during even mild upper respiratory infections and indeed may be found sometimes in normal healthy individuals. Strictest possible precautions are indicated to prevent the spread of these organisms. Such measures should include adequate masking of all individuals coming in contact with the parturient women, and requiring attendants, both professional and non professional, to desist from caring for patients when they are suffering from upper respiratory infections. Negative nose and throat cultures should be obtained before such individuals return to duty. Isolation of morbid patients from the afebrile group should be carried out. Diagnostic and therapeutic procedures should be carried out after the isolation is established.

In the New York Lying In Hospital exhaustive precautions have been taken to prevent this type of puerperal infection. In 14,176 consecutive deliveries of full term and premature infants 1,132 had bacteriological studies of the lochia. The Beta hemolytic streptococcus was isolated on only eleven occasions, namely, in less than 1 per cent of the morbid patients.

### 3 MANAGEMENT OF BREECH\*

HERVEY C WILLIAMSON

The ideal method of the management of a breech presentation is to convert the presenting breech into a vertex by external manipulation whenever this is possible. Cesarean section has no place in the management of this presentation unless there is some other indication. Conservative management of the first stage of labor is most essential. Be prepared for difficulties at the actual delivery of a breech. Deliver the baby with as little manipulation as is possible. Forceps applied to the aftercoming head is advantageous especially in the primipara. Breech extraction is nearly always difficult and should not be attempted unless there is an absolute indication.

### 4 THE SIGNIFICANCE OF THE BLOOD LOSS DURING THE THIRD STAGE OF LABOR

JOHN B PASTORE

A study of the blood loss in 2,370 cases of vaginal deliveries was presented. Special reference of puerperal infection in relation to the blood loss was emphasized. The importance of accurately measuring the blood loss was shown in this investigation.

It was found that the blood loss is of greater value when expressed in terms of body weight, and on that basis 1.0 per cent or more blood loss should be considered a postpartum hemorrhage. The incidence of puerperal infection as well as total morbidity increased with the blood loss. This increase is not due to the amount lost but rather to a decrease in cell volume on the third postpartum day. The incidence of

\*This paper will be published in the February number of the *American Journal of Surgery*



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# PROCEEDINGS OF ACADEMY MEETINGS

## JANUARY

### ANNUAL MEETING

January 7

- I EXECUTIVE SESSION—*a* Reading of the Minutes *b* Report of the Nominating Committee *c* Election of Members *d* Presentation of diplomas
- II PRESENTATION OF ANNUAL REPORTS—(read by title)—The Council The Trustees The Treasurer Committees
- III PAPERS OF THE EVENING—*a* *Address of the Retiring President* Recent Activities of The New York Academy of Medicine Eugene H. Pool *b* *Address of the Incoming President* Ideals in Medicine James Alexander Miller *c* Medicine and the State Hon. Thomas D. Thacher

### STATED MEETING

- THE HARVEY SOCIETY (IN AFFILIATION WITH THE NEW YORK ACADEMY OF MEDICINE)
- THE FOURTH HARVEY LECTURE The Investigation of Intermediary Metabolism with the Aid of Heavy Hydrogen R. Schoenheimer Assistant Professor of Biological Chemistry College of Physicians and Surgeons Columbia University This lecture took the place of the second Stated Meeting of the Academy for January

### SECTION MEETINGS

SECTION OF DERMATOLOGY AND SYPHILOLOGY—January 5

- I READING OF THE MINUTES
- II PRESENTATION OF CASES—*a* New York University College of Medicine *b* Miscellaneous cases
- III DISCUSSION OF SELECTED CASES
- IV EXECUTIVE SESSION

SECTION OF SURGERY—January 8

- I READING OF THE MINUTES
- II PRESENTATION OF CASES—*a* Neuroblastoma of the small intestine (two cases) Saul Alfred Ritter *b* A case of Hodgkin's disease of the ileum Abraham Lightstone *c* A case of left para duodenal hernia John A. Lawler *d* 1 A case of perforated peptic ulcer in an intramesenteric variety of Meckel's diverticulum Operative cure 2 A case of hemorrhage from a peptic ulcer in Meckel's diverticulum Operative cure James E. Thompson
- III PAPERS OF THE EVENING—*a* Meckel's diverticulum Its incidence and significance in routine abdominal surgery B. A. Goodman *b* Carcinoma of duodenum A clinical and radiological study of eighteen cases William J. Hoffman George T. Pack
- IV GENERAL DISCUSSION
- V EXECUTIVE SESSION

COMBINED MEETING OF THE SECTION OF NEUROLOGY AND PSYCHIATRY AND THE NEW YORK NEUROLOGICAL SOCIETY—January 12

- I PAPERS OF THE EVENING—*a* The origin and nature of the hypoglycemic therapy of the psychoses Manfred Sakel (by invitation) Discussion Clarence O. Cheney Karl M. Bowman *b* Clinical experiences with the hypoglycemic treatment of the psychoses Bernard Glueck Discussion John Ross Smith Ely Jelliffe D. Even Cameron (by invitation) *c* Experiences at Bellevue with the hypoglycemic treatment of the psychoses Joseph Wortis (by invitation) Discussion Adolf Meyer

SECTION OF HISTORICAL AND CULTURAL MEDICINE—January 15

- I READING OF THE MINUTES
- II PAPERS OF THE EVENING—*a* Rabelais as a physician Frederic T. van Beuren Jr *b* Count Cagliostro—A great charlatan of the eighteenth century George H. Lathrop (by invitation)
- III GENERAL DISCUSSION Russell L. Cecil Archibald Malloch Frederick T. van Beuren Jr

## SECTION OF PEDIATRICS—January 14

- I PAPERS OF THE EVENING—*a* The current status of the diphtheria vaccines Ralph S Muckenfuss (by invitation), Discussion by William H Park Hugh Chaplin J Leon Blumenthal, *b* The present status of preventive inoculations against whooping cough Louis W Sauer Northwestern University (by invitation) Discussion by Bela Schick William H Park Miss Lucy Mishulow (by invitation), Hattie E Alexander (by invitation) Louis W Sauer After the discussion a film of Louis W Sauer's entitled The Control of Pertussis was presented

## SECTION OF ORTHOPEDIC SURGERY

The regular meeting of the Section of Orthopedic Surgery for January was omitted because of the meeting of the American Academy of Orthopedic Surgeons held in Cleveland January 10 to 14

## SECTION OF OPHTHALMOLOGY—January 18

*Program arranged by THE NEW YORK EYE AND EAR INFIRMARY*

*Instructional Hour, 7 00 to 8 00 p m*

## ORTHOPTIC TRAINING—Conrad Berens

- DEMONSTRATIONS—1 Pathology Department Bernard Samuels, E B Burchell (by invitation) 2 Motor anomalies perimetry reading diagnostic service Conrad Berens, Aniseikonia Department—Demonstration of tilting table H M Fisher (by invitation)

## REGULAR PROGRAM

- I READING OF THE MINUTES  
II PRESENTATION OF CASES—*a* Dacryocystorhinostomy—technique and results Loren P Guy Discussion by Webb W Weeks *b* Aniseikonia with no refractive error Wendell L Hughes *c* Dinitro phenol cataract Clyde E McDannald *d* Use of scotch tape for retaining eye dressings Donald Bogart (by invitation) *e* Venous angioma of the orbit William B Doherty *f* Scleromalacia perforans Samuel P Oast  
III PAPERS OF THE EVENING—*a* Glaucoma and sympathetic ophthalmia, Bernard Samuels *b* Pathology of the orbit—x ray studies Irving Schwartz

## SECTION OF MEDICINE—January 19

*Recent Advances in Vitamin Research*

- I PAPERS OF THE EVENING—*a* Vitamin C excretion in normal and vitamin C deficient subjects and an excretory test for vitamin C deficiency Elaine P Ralli *b* Polyneuritis as a clinical manifestation of vitamin B (B1) deficiency in the alcohol addict Norman Jelliffe *c* The vitamin G or flavin factor of the vitamin B complex Henry C Sherman (by invitation) Discussion George R Cowgill New Haven (by invitation) Henry C Sherman Irving S Wright  
II GENERAL DISCUSSION

## SECTION OF GENITO URINARY SURGERY—January 20

- I READING OF THE MINUTES  
II PAPERS OF THE EVENING—*a* Problems in the surgery of renal calculi Thomas E Gibson San Francisco (by invitation) *b* Management of ureteral calculi in the lower third of the ureter Arbor D Munger Lincoln Neb (by invitation), *c* Review of V type nephrotomy of staghorn calculi with especial reference to final results George C Prather Boston (by invitation) Discussion to be opened by Charles C Higgins Cleveland Ohio (by invitation) Discussions continued by Henry C Bugbee Howard S Jeck Francis P Twinnem  
III GENERAL DISCUSSION

## SECTION OF OTOLARYNGOLOGY—January 20

*Care and Training of the Deaf and Hard of Hearing Child*  
(The New York State Law now requires that all children under six years of age with hearing losses be reported)

- I READING OF THE MINUTES

- II PAPERS OF THE EVENING—a Hearing and its conservation in the schools William E Grady (by invitation), Assoc Supt Schools N Y C b Organizations for service to the hard of hearing—1 National Betty C Wright (by invitation) Amer Soc for H of H 2 Local Annette W Peck (by invitation) Exec Sec N Y League for H of H c Service in New York City's School for the Deaf Jay D Whitham (by invitation) Aurist P S 47 d Fundamentals of lip reading including demonstrations with the audience as subjects Estelle Samuelson (by invitation) N Y League for H of H e Parent teacher training Irene B Young (by invitation) Sec Amer Nursery Schools for speech and hearing f Role of prevention clinics Westley M Hunt Discussion by Ross Faulkner Elizabeth Gardiner Dir Div Child Hygiene N Y State Dept of Health Hugh G Rowell (by invitation) John Durkee (by invitation) August Hambrook (by invitation) Chair Pub Rel Com Med Soc State of N Y David Caplin Asst Dir Health N Y State Ed Dept Emily Pratt (by invitation) Supt N Y State Ed Dept g Rehabilitation of the deaf child (demonstration with pupils from the Central Institute for the Deaf) Max A Goldstein (by invitation)

### III GENERAL DISCUSSION

### IV EXECUTIVE SESSION

#### SECTION OF OBSTETRICS AND GYNECOLOGY—January 26

*Program presented by the staff of THE LIVING HOSPITAL*

(Department of Obstetrics and Gynecology New York Hospital)

- PAPERS OF THE EVENING—a Erythroblastosis fetalis as a cause of infantile mortality Carl T Javert (by invitation) b Prevention and control of puerperal infection due to the beta hemolytic streptococcus R Gordon Douglas (by invitation) Discussion Herbert F Traut c Management of breech Hervey C Williamson Discussion C Frederic Jellinghaus d The significance of the blood loss during the third stage of labor John B Pastore (by invitation) Discussion Byron H Goff e Evaluation of male fertility—A motion picture demonstration William H Cary (by invitation) Discussion Robert S Hotchkiss (by invitation)

### AFFILIATED SOCIETIES

#### NEW YORK ROENTGEN SOCIETY

The regular January Meeting was omitted because of the Eastern Conference of Radiologists held in this city January 29 and 30

#### NEW YORK MEETING OF THE SOCIETY FOR EXPERIMENTAL

#### BIOLOGY AND MEDICINE—January 20

- I Synthesis of protein and amino acids in mice with the aid of deuterium J A Stekol W H Hamill  
II pH changes of muscle during and after contraction M Dubuisson (Introduced by, L Michaelis)  
III Treatment of cardiac insufficiency with a preparation containing two water insoluble glucosides of squill R L Levy F L Chamberlain  
IV A complement fixation reaction involving the rabbit papilloma virus (Shope) J G Kidd (Introduced by P Rous)  
V Leucocyte infiltration of mouse sarcoma 180 irradiated *in vivo* and *in vitro* R Chambers C G Grand  
VI Radiosensitivity of mouse sarcoma 180 irradiated *in vivo* and *in vitro* P S Henshaw K Sugiura  
VII Some effects of iodine given to rabbits after a period of cholesterol feeding K B Turner E H Bidwell

#### NEW YORK PATHOLOGICAL SOCIETY *in affiliation with*

#### THE NEW YORK ACADEMY OF MEDICINE—January 28

#### *The Anniversary Meeting*

- I CASE REPORTS—a Two cases of tuberculosis of the myocardium Russell Holman (by invitation) and J J Hawthorne



II PAPERS OF THE EVENING—*a* Rheumatic commissural lesions and their relation to the so called congenital bicuspid aortic valve of the adult Louis Gross *b* Physiological response of prostatic and vesicular tissue transplanted into the eye Robert A Moore, H B Rosenblum (by invitation) S H Tolins (by invitation) and R M Melchionna (by invitation)

III EXECUTIVE SESSION Election of Officers

## DEATHS OF FELLOWS OF THE ACADEMY

HOLDEN, WARD ANDREWS, A B, M D, 2 East 54 Street, New York City, received the degree of Bachelor of Arts from Marietta College of Ohio in 1884 and the degree of Doctor of Medicine from the Ohio Medical College in 1887, elected a Fellow of the Academy December 6, 1894, died January 24, 1937

Dr Holden was honorary surgeon to the Herman Knapp Memorial Eye Hospital and oculist to The Neurological Institute He was at one time professor of clinical ophthalmology at the College of Physicians and Surgeons

Dr Holden was a member of the American Ophthalmological Society and a Fellow of the American Medical Association

He was the author of several books and many papers on ophthalmological subjects

STEINER, JOSEPH MANNING, M D, 170 East End Avenue, New York City, graduated in medicine from Tulane University in 1904, elected a Fellow of the Academy January 15, 1925, designated a Fellow in Radiology in 1933, died January 27, 1937

Dr Steiner was consulting roentgenologist to the New York Infirmary for Women and Children He was at one time head of the x-ray department of the Roosevelt Hospital

Dr Steiner held a certificate from the American Board of Radiology and was a member of the American Roentgen Ray Society, the American College of Radiology, the New York Society of Approved Roentgenologists and the County and State Medical Societies He was also a Fellow of the American Medical Association

WARREN, LUTHER FISKE, M D, 200 Hicks Street, Brooklyn, New York, graduated in medicine from the University of Michigan in 1909, elected a Fellow of the Academy October 1, 1914, died January 18, 1937

Dr Warren was chief physician to the Long Island College and St John's Hospitals and consultant physician to the Harbor, Coney Island, South Side and Methodist Episcopal Hospitals Since 1928 he had been head of the department and professor of medicine at the Long Island College of Medicine He was at one time president of the New York State Board of Medical Examiners

Dr Warren was a Fellow of the American College of Physicians and the American Medical Association, and a member of the American Society for the Advancement of Science, the National Tuberculosis Association and the County and State Medical Societies

# BULLETIN OF THE NEW YORK ACADEMY OF MEDICINE

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## THE ORIGIN AND NATURE OF THE HYPOGLYCEMIC THERAPY OF THE PSYCHOSES\*

MANFRED SAKEL

Three and one half years have now passed since I first reported a new method of treating psychoses to the Medical Society of Vienna. The treatment was new because it was the first to make use of the hypoglycemic state for therapeutic purposes. Hypoglycemia was up to then universally avoided because it was dangerous, this was the first time that a method was developed which at once diminished its danger and utilized its effects.

Three and one half years have passed and I am now in a much better position to report not only my own experiences but also the corroborations of the work which have since appeared in many countries, so that my own original observations can now be said to have been tested and confirmed. That this has been possible is due to the tireless efforts of a man to whom my deepest thanks are due, a man who has not only lent his scientific authority but also the entire strength of his character unselfishly to the promotion of this work. The man to whom I refer is the head of the Psychiatric University Clinic of Vienna, Professor Otto Poetzl. My thanks are due to him not only for personal reasons but for impersonal reasons also. If he had not extended his help and placed his clinic at the disposal of this work, it might have taken a long time or might even have been impossible to develop this new therapy.

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\* Read before a combined meeting of the Section of Neurology and Psychiatry and the New York Neurological Society, January 12, 1937

The idea of hypoglycemic and hypoglycemic shock treatment of psychoses goes back to the year 1928, although it required time thereafter to develop the therapy to the point where it could be practised in the way I described in my monograph. The idea behind this treatment was a logical consequence of the idea which led me to introduce moderate doses of insulin in the treatment of morphine addiction. The observations I made in connection with a few instances of accidental deep hypoglycemia in the course of this treatment of drug addiction, encouraged me to attempt the use of hypoglycemia in the treatment of psychoses, for the changes I saw in the mental picture both during and after deep hypoglycemia were remarkable and demonstrated to me beyond a doubt that hypoglycemia either directly or indirectly can influence psychotic states in a way that could be put to practical use.

It was at this point that I made the transition from insulin treatment to hypoglycemic treatment of psychoses. But before all these considerations could be developed into a practically useful form of treatment, a method had to be developed by means of which we could reduce the possible dangers, which were certainly overestimated at that time, to a minimum. A technic had to be found which would permit us to recognize dangers as they occurred so that we could avoid them or prevent them. Definite procedures had to be found for meeting each of the complications as they occurred.

When this method was developed we could say that we could now utilize hypoglycemia as such in the treatment of psychoses without running any great risk. But this method in itself did not tell us how it could be applied so as to achieve the best therapeutic results. In fact in most cases it was only when we approached the danger zone that we could achieve the best therapeutic results. If instructions are followed carefully and a standard technic is used the treatment is relatively safe but it is nevertheless true that it is possible to avoid all the attendant dangers and at the same time forget that the real purpose of the treatment is to cure the psychosis. If one is too preoc

cupied with the possible dangers of the treatment, he is in danger of forgetting its actual purpose. Success depends on the right combination of both considerations. I shall now briefly sketch the procedure without going into the theoretical considerations which underlie it, for the time at my disposal is not only short but the theories themselves are rather vague and of no great practical significance.

The method which I have described in my monograph is only meant to be an outline which has to be modified in each individual case. Therapeutic results depend not only on the production of a hypoglycemic state but on the proper use and management of every single hypoglycemic shock. The results do not depend on the size of the dose of insulin but rather on the proper termination at the right time of each hypoglycemic state. One has to be acquainted with the various conditions that arise and needs considerable personal experience before he can manage the hypoglycemia effectively. It may also be emphasized that one has to be a good psychiatrist in the ordinary sense with sound psychological judgment and insight. Psychological considerations are important throughout the treatment. Without doubt we now believe that in mental disease as in physical, psychological factors are not only of psychological consequence but may produce also pathophysiological changes through the vegetative nerves and indirectly may even produce anatomical changes. If this be true how can anyone believe that psychological factors and psychological attitudes are unimportant considerations?

When the treatment first developed I could not say exactly why I would terminate the hypoglycemia at one point in one instance and at a different point in another, or why I would vary the period of hypoglycemia in the same patient in different stages of treatment. The probability is that I was guided by dim subconscious recollection of my prior experiences in similar instances. It was only after a time that I was enabled through retrospection to indicate in a general way certain principles of management for different groups of patients and I hope that in

spite of the difficulties involved in the treatment, these guiding principles will permit a wider application of the method. It should not be forgotten that this treatment is not merely pharmacological. It would be more appropriate to say that the medicine is used as a tool and as in any other treatment which depends on the use of instruments, one must first learn how to handle the tool, then seek to improve the technic. It is emphasized that a superficial knowledge of the simple principles of the method does not suffice. Before the therapeutic possibilities of hypoglycemia can be explored, the technic has to be learned just as the technic for a surgical operation.

### THE METHOD

*This consists of four phases*

- Phase 1    Preparatory phase
- Phase 2    Shock phase
- Phase 3    Rest period
- Phase 4    Polarization or terminal phase

**PHASE 1** The initial dose varies from eight to thirty units of insulin depending on the patient's physical condition and the duration of his illness. The injection is given in the early morning to the fasting patient and four hours later he is given a solution of glucose. The dose is increased five or ten units daily until the patient begins to show his first hypoglycemic symptoms three or four hours after the injection. As soon as hypoglycemic coma is obtained, Phase 2 begins.

**PHASE 2** After the proper dose has been reached the patient is given a shock dose daily. This shock dose, however, does not necessarily remain constant. Very often in the course of treatment the patient may develop coma with a much smaller dose. It rarely happens that the shock dose has to be increased after it is found. Coma is terminated four or five hours after the insulin injection with a nasal tube feeding of 400 c c of sugar solution containing 100 to 200 grams of sugar, depending on the amount of insulin that is given.

The most important point in the treatment is to know when to terminate the hypoglycemia. In deciding when to terminate we are guided by two considerations which unfortunately do not always coincide. The first consideration is the patient's physical condition, with particular consideration to danger of collapse. When there are danger signs, we must end the hypoglycemic state whether or not we think it is advisable from the viewpoint of the patient's mental condition. The only other consideration in deciding when to terminate is whether or not it will benefit the patient's mental state.

Whenever a dangerous or threatening situation arises, the hypoglycemia is quickly terminated with intravenous glucose administration or with adrenalin. Phase 2 is continued until the desired results are achieved.

**PHASE 3** This phase is no longer considered important. It is a day or more of rest and only becomes necessary because the patient grows physically exhausted from shock or repeated hypoglycemia.

**PHASE 4** During the terminal phase which lasts from four to eight days, the patient is only given a small dose of insulin as compared with his shock dose and the hypoglycemia is terminated in two hours with the administration of glucose.

I realize that even though I have given you only a brief description of the hypoglycemic method of treatment, I have told you nothing of the value or effectiveness of the treatment. Since I know that this interests you most, I shall try in the short time at my disposal to describe briefly some typical reactions of psychotic subjects to hypoglycemia.

#### THE INFLUENCE OF HYPOGLYCEMIA ON HALLUCINATIONS

The mental changes that occur in a psychotic subject in the course of treatment are usually so surprising and dramatic that it is difficult to describe them accurately. With few exceptions all sorts of hallucinations—visual, auditory and somatic—are diminished or disappear totally during hypoglycemia, at first only for a short time and

during a certain stage of the hypoglycemia. A patient, for example, with paranoid ideas or with ideas of reference suddenly loses his hallucinations when the hypoglycemia has reached a certain depth and may suddenly for a short time show an insight into the hallucinations which he has just had.

At the beginning of treatment the patient regularly becomes psychotic again as soon as the hypoglycemia is ended. One gets the impression that the patient has two kinds of consciousness and that he has exchanged one for the other. When one has seen this dramatic change he begins to appreciate why people in the olden days spoke of a man's being "possessed."

As treatment progresses the lucid phases during hypoglycemia become more and more protracted and finally begin to survive the point of termination. The patient then remains clear and free of his hallucinations for a considerable time. Cases which are progressing favorably remain symptom-free throughout the day until the following treatment next day, that is, they remain without hallucinations and show insight into their illness. At this point a curious thing happens. The same patient who at the beginning of treatment had lucid periods during hypoglycemia only to become psychotic again after termination, now for the first time becomes completely symptom free throughout the day but begins to show psychotic symptoms again for a short time during hypoglycemia. In other words he now shows a reversal of reaction. In effect then, the hypoglycemia at first revives the normal personality of an acutely psychotic individual. Later when the patient has improved, the hypoglycemia serves to revive the psychosis which had been repressed but not yet eliminated. However, these psychotic symptoms of hypoglycemia are themselves soon diminished and finally eliminated, so that the patient is at last symptom-free both during hypoglycemia and thereafter.

In other cases the hypoglycemia, instead of provoking a lucid phase, converts the patient's mental picture into something that is just its opposite. A stupor for example,

may be converted into a productive psychosis or the patient awakens in normal mental state. As the patient improves and remains awake, even outside of hypoglycemia, he may in the final stage of treatment again become stuporous for a short time during hypoglycemia, so that there is again a reversal of reaction. Not only the patient's mental picture, but the patient's emotional state as well may be converted into its opposite under the influence of hypoglycemia. After one has had considerable experience one gets the impression that every hypoglycemic state removes another portion of the psychosis and allows another bit more of the repressed normal personality to achieve dominance. What we attempt to do in the course of treatment is to stabilize or fixate the dominance of the normal personality.

If we sum up this superficial description of the patient's reaction to hypoglycemia, we get the following impression. The hypoglycemic state weakens, inhibits and finally represses that portion of the mind which happens to be most active at the time, so that the hitherto latent subdued and repressed portions—if I may so express myself—are again brought to the surface so that they can again prevail over the elements which are now repressed. This is particularly clear when the hypoglycemia reaches its greatest intensity just before the onset of coma.

In cases which run a favorable course, the repeated hypoglycemic states finally eliminate the psychosis so that the normal personality can again achieve complete dominance. By way of illustration, I shall describe one of many cases. A 20 year old girl is admitted for treatment. Her illness dates back about a year and a half before her admission. For the past eleven months the patient had been given all the modern forms of treatment, such as malaria, typhoid vaccine, endocrine treatment, sleep treatment. The psychosis developed further and the patient's condition was getting worse. She was diagnosed as a hebephrenic schizophrenia, and the consultants said at first that the outlook was dubious and later declared that her condition looked more and more hopeless. Some of



the best known psychiatrists in Europe had been interested in the case

On admission the patient was mute and had to be tube fed. She lay continuously in a stereotyped embryonic position, kept grimacing and appeared very apprehensive. For months the patient had remained in this condition, completely indifferent to her personal needs and only occasionally showed transitory periods of excitement. I shall only try to give you a brief sketch of the course of her treatment. After the first insulin injection of 30 units the patient's attitude grew somewhat more relaxed and three hours after the injection the patient got out of bed, asked for food, and occasionally responded to questions. On the following days the patient's reaction was less marked and she apparently showed little response except with regard to her habitual position. Every time the patient passed into a hypoglycemic state, she abandoned her embryonic position and lay in a normal position in bed. She did not show the least degree of somnolence and seemed to be unchanged otherwise. The patient had not yet gone into coma but she again returned to her former stereotyped position from which it was impossible to move her.

As the dose was further increased the only change was that she grimaced less frequently. The patient had her first comatose reaction in the third week of treatment after an injection of sixty units of insulin. At this time the patient was still negativistic, apathetic, stereotyped and inaccessible. Three and one-half hours after the injection of sixty units of insulin, the patient became comatose. When she awakened, she acted like a person who had just been in a deep sleep. "Where am I?" she asked, "What day is this?" As she spoke she gradually grew more composed and began to realize where she was. The patient spoke of her hallucinations with full insight. "I thought I was in a hotel where I was being kept as a prisoner. I thought the doctors were waiters who had been bribed to keep me here. I heard other prisoners in the next room calling out for help." She said she struck her parents because

she thought they were behind all this. The patient gradually began to show a normal emotional response. She began to cry. She said she was afraid that her parents might blame her for her behavior. They might not realize that she was very sick and might hold it all against her. After a few hours had passed, this phase of lucidity began to disappear, but the patient continued to be talkative throughout the day. The following day, after the hypoglycemia was terminated, the patient took a walk in the garden with her mother, and was able to converse fairly well. The patient, however, was still having hallucinations. She suddenly snatched up some fallen leaves in the garden and said that they were made of gold. On the third day, as the patient awakened from hypoglycemia, she said spontaneously, "I had some funny ideas yesterday. I thought there was gold lying around in the garden, that somebody had left it there for me." After each successive hypoglycemic period, the patient progressed another step forward. After eight days had passed, the patient was completely symptom free, with full insight into her illness. When some books were offered to her, she looked them through, and said she thought they would make heavy reading for a person in her condition, but she refused to talk about her past behavior. She went to the movies, and acted in a perfectly normal way. Treatment was continued, however, until the patient no longer showed the least trace of her previous psychosis.

Three and a half years have since passed, and the patient continued her former studies as a University student, and is in complete health.

However, not every case has so short or even a course. But the following case will again show how close the relation must be between the treatment and the improvement. The patient was a woman of fifty years whose history indicated the presence of a long-standing but relatively mild paranoia which must have existed for a decade, although the patient had always adjusted fairly well. She was married and had children, one of whom was schizophrenic.

The paranoid condition continued throughout the patient's married life although she could conceal it very successfully. It was discovered that the patient, who was a woman of means, would occasionally hire female detectives to act as domestic servants to protect her from the threats of her enemies. When the patient was fifty-four years of age she suddenly grew worse and had to be confined in a hospital. She grew dangerously aggressive and made two attempts at suicide. She also developed auditory and visual hallucinations and became very disturbed. After the patient had spent two years in a private sanitarium, her husband managed to have her stay in a secluded villa with two physicians and attending nurses. Professor Willmair, who was interested in the case, told the husband that the prognosis was most unfavorable and that there was no hope of improvement. At Willmair's suggestion it was decided to try hypoglycemic treatment as a last chance. After four weeks of treatment, the patient showed improvement in spite of the fact that the patient's condition was complicated by diabetes and other disabilities. After the patient was under treatment for four weeks, I was called. In eight days during which the patient was successfully brought into deep shock, she had become perfectly clear and begun to show some insight into her illness. In two weeks she was sufficiently improved to take a trip to Italy with her husband. She now writes that she is in excellent condition, and her husband states that it has been ten years since she has been so well.

I have only selected two cases from a great many to indicate that there is a close connection between the treatment and the patient's improvement. From a large and varied number, I have chosen a few interesting and typical examples of the influence of hypoglycemia upon psychotic states. It is not merely my own impression that prompts me to say that anyone who has sufficient experience with the treatment and some insight into the phenomena must recognize that hypoglycemia has a special influence on a psychosis. One cannot escape the impression that he may deliberately influence the nucleus of the psychosis by

hypoglycemia Quite aside from the therapeutic results, the entire phenomena and the individual reactions are sufficient to show that the psychosis is influenced in a special way by hypoglycemia

Improvement, it is true, may just happen to coincide with the treatment, but when such coincidences occur so often, it must be assumed that they are more than merely accidental

My own experience now includes over 300 cases, and there are as many more cases treated under my supervision by others, but I am perfectly well aware of the difficulty there must be in reducing the material to statistics from which the value of a new treatment of schizophrenia can be determined The natural fluctuation which occurs in the course of the disease, the absence of the definite symptoms that we have in physical diseases, and the impossibility of making a certain prognosis in a particular instance, all make it difficult to estimate results, especially when the number of patients observed is small When in so large a series of patients as I have treated up to now, and with the results confirmed by others, the net result is a percentage of remissions which is at least four times greater than the most optimistic figures for spontaneous remissions, then I think, the most conservative will conclude that this treatment is effective

In estimating the results of this treatment, one has to distinguish between recent cases, that is cases of no longer than six months duration, chronic cases, that is cases of over a year and a half duration, and the group of cases between six months and a year and a half duration In formulating this estimate I attach particular importance to the definite concept of a full remission A full remission means that the patient is symptom free after the treatment has been concluded, that he has full insight into his illness, that his emotional reactions are normal, and that he can return to his former work In addition to full remissions, I speak of good remissions—that is, a condition in which the patient is free of schizophrenic symptoms, and can re-

sume his former work, but has some slight degree of defect. And finally, I speak of social remissions. The concept of mere improvement has not been used in formulating the statistical results. After defining these concepts and reviewing my first group of over 100 cases carefully, I have found the following results. In recent cases, 88 per cent had good or full remissions, and could go back to their former work. Of these, 70 per cent were full remissions. In all other cases, that is all cases of over six months duration, the results vary in direct relation to the duration of the illness. Forty-seven per cent of the cases showed good remissions with capacity to work, of which 19 per cent were full remissions.

When we examine the statistics for spontaneous remission in schizophrenia in various countries, we find that the figures vary between 5 and 20 per cent of remission, according to the author. Even if we compare it with the optimistic figure of 30 per cent, we still have a large balance in favor of the treatment. I should like to add that I formerly thought that only recent cases would show a satisfactory response to treatment. Later I realized that in some chronic cases more or less improvement was possible, and it was well worth trial, for it is not a matter of indifference if the chronic cases can be improved. When one considers how serious a problem chronic schizophrenia has become, and how much can be done to improve these conditions, it seems well worth the effort.

At the invitation of State Commissioner Dr. Parsons, I have recently conducted a course in the technic of this treatment for twenty-five physicians, representing the various New York State Hospitals, at the Harlem Valley State Hospital. The case material brought together for treatment in the course of this instruction consisted largely of chronic cases of an average duration of four years. Two cases, at most, were possibly of less than a year and a half duration. The others were some of them mute and apathetic, others disturbed and under restraint, and still others only able to make stereotype movements. Even

with material of this sort, and in spite of the fact that they have up to now had only twenty-five days of treatment, eight patients are already fit for discharge, not as full remissions, but as social remissions who could, under favorable circumstances, return to work. An additional four cases will probably soon become eligible too, so that it can be said that although the treatment has produced in these cases no cures, it has at least proved its value. All the remaining cases with two exceptions, have improved enough to be able to adjust themselves at least to the requirements of institutional life.

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ANNUAL POSTGRADUATE INSTITUTE

*of the*

PHILADELPHIA COUNTY MEDICAL SOCIETY

The New York Academy of Medicine extends its greetings to the Philadelphia County Medical Society on the occasion of the Second Annual Post Graduate Institute, which will be held at The Bellevue Stratford Hotel, Philadelphia, Pa., April 12 to 16.



## RECENT ACTIVITIES OF THE NEW YORK ACADEMY OF MEDICINE\*

EUGENE H. POOL, PRESIDENT

First of all I want to refer to that which is uppermost in the minds and hearts of us all. Let me voice my admiration of the fortitude and abnegation of Dr. Hartwell. Through a long illness he clung to his duties and continued from his bed to be the de facto Director of the Academy. What a joy it is to note that his patience has been rewarded by a return to health. I also call to your attention the loss of a faithful servant of the Academy, Dr. Reynolds, who retired by reason of the age limit though at the height of his usefulness. We are fortunate in securing the services of Dr. Ashford, also an Army officer, to take his place. If accomplishments of worth have occurred during the recent administration, all credit must be ascribed to the Director, his Associates and the self-sacrificing efforts of numerous fellows.

What is the role, the objective of the Academy? It is a great service station for the population of New York, both lay and professional. It may be governed by its 2,000 fellows but it operates for the benefit of the 12,000 physicians and the seven million citizens who are under their care. It was instituted on the sixth of January, 1847, just 90 years ago. Among its founders were men, like Jacobi, who were erudite and versed in the classics. The term "Academy" was selected by them as indicating "a society of learned men united for the advancement of the arts and sciences and of literature." They had in mind the original Academy—that little grove near Athens—where Plato and his successors carried on their philosophic dissertations and teaching. It was intended therefore primarily as an institution of learning. As such, it was believed, it would have the greatest opportunity for service.

The work of the Academy is carried on through Committees. A brief summary of their accomplishments during the past year should enlighten you as to the results of the

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\* Address of the Retiring President. Delivered at the Annual Meeting of the Academy held January 7, 1937.

initial objective. Moreover, in justice to those who have thus labored for you it is fitting that you should be informed as to their accomplishments.

The most important activities of the Committee on Medical Education were the Annual Graduate Fortnight, the subject being "Trauma, Occupational Diseases and Hazards", the Friday Afternoon Lectures which show a larger attendance each year and the Bureau of Clinical Information which serves an ever increasing number of physicians.

The Committee, sensing the fact that the clinical resources of New York are not sufficiently developed and coordinated to provide the greatest opportunities for post graduate study is pursuing an investigation which it hopes will lead to the expansion and improvement of existing facilities for graduate education and the encouragement of more physicians to profit thereby. A subcommittee is surveying the opportunities for postgraduate study in obstetrics. In this connection I must emphasize that post graduate instruction, especially in surgery, is the weakest link in the whole chain of medical education. No solution has yet been reached, yet the need for it is unparalleled in any other branch of medicine. As Dr. Williams stated "the Academy is not and cannot become a graduate school of medicine but it should become more and more the centre of information and the promoter of activities for affording opportunities to physicians for their continued education."

The Medical Information Bureau handled over 5,000 inquiries. Created as a Press Relations Committee, the Bureau has been called upon by many other groups. In 1936 the press inquiries numbered five times more than in 1928, but represented only 21 per cent of the total. Particularly noteworthy is the number of inquiries received from physicians, which exceeds those from the press. Not infrequently, the Bureau is asked to supply material for "feature" articles, dealing with important subjects such as infantile paralysis, the serum treatment of pneumonia, or the curability of cancer. Papers and periodicals frequently call on the Bureau to check the scientific accuracy



of articles submitted, for editorial assistance, and for information concerning advertisements of a medical and health nature. The Bureau issued 313 daily columns to the Associated Press and 40 medical releases on the activities of the Academy and the County Medical Society. It also assisted a number of public health organizations in promoting their educational activities, and arranged for the delivery of 404 radio talks. The fellows of the Academy presented weekly radio addresses on timely medical subjects. Over 5,000 letters requesting copies of these were received. The Lectures to the Laity on the Art and Romance of Medicine, were eminently successful. They have been published in book form. A second series has been arranged for the coming year.

It is evident from this outline of the activities of this department that the Academy is actively and successfully contributing to the education of the public and the profession. But more important is the fact that it is favorably influencing the type of information that is broadcast, using the term in its broadest sense. Misinformation and sensational presentations of medical matters now less frequently find their way into the lay press. Formerly, this phase was so misused that false hopes were often raised in the minds of sufferers, and the press was exploited for commercialism and advertising. We are nearing the time when this will be substantially eliminated, but aggressive efforts must be continued and towards this end the cooperation of the profession must be maintained.

The Committee on Public Health Relations was characteristically active throughout the year.

A study was made of the use of oxygen because of evidence that the equipment necessary for oxygen therapy is frequently not of the proper kind and its administration is often wasteful and ineffective.

Much time was devoted to the sections of the City Charter which apply to the Departments of Health, Hospitals, Public Welfare, Housing, Sanitation and Education. The opinions formulated by the Committee influenced the Charter Revision Commission and a number of its proposals were adopted.

The Department of Education of New York City employs about 40,000 persons. Many problems arise which require medical opinion. At the request of the Superintendent of Schools, the Committee inquired into the various phases of the problem. It recommended reorganization and enlargement of the present service, and extradepartmental boards to decide questions of difference between the medical officers of the Department and private physicians treating teachers. The views of the Committee were asked as to tests for candidates for medical positions in the Department and on the question of milk for undernourished children in the schools.

The Committee prepared for the guidance of the Board of Examiners a list of cardiologists, and designated three of its members to serve on the committee created by the Board of Education for the care of the handicapped child. Recommendations made by the Committee to the Court of Domestic Relations have been adopted, also the recommendations in relation to the handling of the prostitutes by the Magistrates Courts. The Committee formulated criteria for the diagnosis of syphilis and gonorrhea in women, which have been adopted by the Department of Health.

From its inception, a quarter of a century ago, the Committee on Public Health Relations has been consulted as to the budgetary requirements of several of the City departments. During the past year attention was given to the needs of the Department of Health. Stress was laid particularly on strengthening the Bureau of Laboratories, the Division of Food and Drugs, and increase in the number of public health nurses. In the Department of Hospitals the principal suggestion was the creation of a Division of Tuberculosis with an administrative director.

A considerable number of bills are introduced each year in the State Legislature relating to the public health. Many of these proposals are not carefully thought out or are distinctly inadvisable. It is a function of the Committee to call to the attention of the various legislative committees the pros and cons of such proposals. Some of the measures which were discussed during the year related

to working hours in hospitals, the transfer of responsibility for school medical work from the Department of Health to the Department of Education, the perennial bill against vivisection, the establishment of special relief agencies for veterans, legislation with regard to milk and cream inspection, a bill prohibiting the collection by hospitals of fees for medical services, and bills regulating the question of medical testimony in cases of alleged insanity

With the exception of the summer months, the Committee is in session every Monday afternoon and its subcommittees hold meetings almost daily. Enough has been said to evidence the important problems relating to the health and welfare of the Community which have been conscientiously studied and effectively handled. This implies the confidence of the civic authorities which can be held only by patient and judicious work. The present year marks the 25th Anniversary of the Committee on Public Health Relations. Recognition of the immensity of its important contributions during this period is in order and deep appreciation from all concerned is due to Dr. Dana, Dr. Miller and Dr. Corwin, who have been its motivating forces throughout these years.

I hope the Academy will support the contemplated plan of an Institute of Forensic Medicine. About one fifth of the deaths in Greater New York come within the jurisdiction of the Office of the Chief Medical Examiner. Over 3,000 autopsies are performed annually. The vast opportunities for research and teaching are to a great extent lost. It has been proposed that an Institute of Forensic Medicine be established around the Office of the Chief Medical Examiner, in organization and scope similar to institutes in some of the capitals of Europe.

To quote Dr. Williams again, "the Library is the greatest single instrument that we have for continued education."

During the past year there has again been a notable increase in the number of readers in the Library. There were 55,607 during 1935, and 58,528 in 1936, an increase of about 3,000. The attendance has almost doubled since 1928. Also, 3 per cent more books from the stacks have been consulted.

As a consequence the Reference Department has been busier than ever before and the delivery lobby has become unduly crowded

Last Spring, Dr Alfred E Cohn, Chairman of the Committee, appointed two subcommittees to study the Library. A complete report, with recommendations, was submitted to the Council. Four important needs were emphasized: (1) Increase in the salaries of certain members of the Library Staff, who are much underpaid in comparison with similar positions in other libraries, (2) an increase in the staff, (3) provision for the purchase of books which were not bought during the depression and for rebinding old books. The Trustees allotted a sum of \$10,000 for these purposes. (4) addition of seven or eight floors to the present book stacks and more space for the general card catalogue, both of which will be necessary in three years. The estimated cost is \$300,000.

I have emphasized in the review of our work the efforts of these who have labored for you. While the number is large it should be greatly expanded. The younger fellows should be drawn upon to a larger extent and some system should be devised to develop an army of available recruits. The main burden of the Committee work has been carried by the respective secretaries, Dr Corwin, Dr Reynolds and Dr Galdston and the Librarian, Dr Malloch. We are under deep obligation to them for most efficient efforts.

Note should be taken of our financial status. I call your attention to the report of the Treasurer, it shows the efficient and satisfactory manner in which our investments have been handled. Our ability to meet expenses with a relatively small deficit is dependent upon annual gifts by several anonymous donors amounting to \$20,000. It must not be overlooked, however, that the members bear the greater part of the burden, contributing in dues and initiation fees over \$75,000, a year, besides an appreciable amount in legacies and gifts.

And this brings me to the feature which I particularly wish to emphasize. In my address one year ago attention was called to the fact that the public has never been ade-

quately informed as to the part which the Academy plays in the life of the community, and that the citizens of New York do not appreciate that the Academy is constantly making considerable contributions towards their welfare. Let me repeat that the Academy is a public service station. On account of its stable and permanent type of organization and its judicial and conservative attitude, the Academy is frequently called upon to aid the municipal and State authorities in solving problems of interest to the public. Its ability to cooperate is possible by reason of the fact that the Academy has a large staff of expert and trained investigators.

Before recording the needs, emphasis should be placed on the fact that the Academy is managed most economically. The expenses of every department have been cut down to the lowest limit. But every department needs additional funds not only for expansion but in order to keep the work up to the proper standard. Larger amounts should be provided for maintenance to prevent deterioration of the plant. The constantly increasing demands upon the Academy can be met only by an increase in the Staff. Certain of the salaries, all of which are still on the reduced scale which the period of depression made necessary, should be increased. The Library which is the outstanding feature in our whole structure cannot be allowed to wane. As has been indicated a large sum is necessary to provide the necessary facilities to the profession and the public which are expected of the second largest medical library in the Country.

While a number of generous individuals recognize the value of the work the public as a whole has never participated. Through a special committee our needs will be presented during the present year and an opportunity will be offered to assist in the development of our work and activities.

We must recognize the fact that the Academy is only one of the groups of which the medical profession of New York is composed. Its activities have increased and broadened in recent years, so much so that not infre-

quently problems which it is called upon to study are problems of interest to the profession as a whole. It is highly desirable that the cordial relationship and mutual confidence between the various groups which make up the medical profession of New York, be continued and solidified. Only by such a spirit can the profession hope to control its own destinies and avoid interference by outside forces.

This is the time for looking forward not for smug retrospect. Tonight is dedicated to youth, to new ideas, to plans for the future, visions and how they may be materialized. Your new leader embodies all that the Academy could hope for in the direction of progress and ideals. While it is with a sad heart that I relinquish my office it is with confidence and enthusiasm that I turn over the helm to Dr. James Alexander Miller.

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### THOMAS WILLIAM SALMON MEMORIAL LECTURES

The fifth series of Thomas William Salmon Memorial Lectures will be given by Dr. William Healy at The New York Academy of Medicine on Friday evenings, April 9, 16 and 23, 1937, at 8:30 o'clock. These lectures are under the auspices of the Salmon Committee on Psychiatry and Mental Hygiene.



# IDEALS IN MEDICINE\*

JAMES ALEXANDER MILLER

Somewhat more than twenty-five years ago a frail figure possessed of a dynamic personality held a crowded medical audience spellbound by the power of his message. To those of us of the then younger generation who were present upon the occasion when Doctor Edward Livingston Trudeau delivered his presidential address to the Congress of Physicians in Washington, upon the subject "The Value of Optimism in Medicine", an inspirational uplift was given which the passage of time cannot dim and will never efface. In the search for an appropriate topic upon which to address the Academy of Medicine upon this occasion, the memory of that similar, though more notable, occasion has kept recurring to my mind. In my thinking there was a wistful desire that, privileged as I had been to be intimately associated with Doctor Trudeau over a long period of years, I might possibly be enabled to pass on to another medical generation something of the idealism of the man, of whom perhaps we most often think as a pioneer scientist and physician but whose outstanding gifts were those of the spirit and of personality through which he so powerfully impressed that audience of years ago.

I approach the task which I have set myself with the greatest diffidence, fully aware of my own inadequacy. I am, however, encouraged to persist because of a deep seated conviction that in this present troubled world we need to hold fast to our ideals as perhaps never before, and also because I cherish the hope that in spite of the imperfections in the presentation, nevertheless something of the spirit of that great man whom I have recalled to your remembrance may come through to you.

## THE SCIENTIFIC IDEAL

In the consideration of ideals in medicine with little doubt the first impulse of the modern medical mind would be to visualize the possibilities of medicine as an exact science. The progress which has been made in this direc

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\* Address of the Incoming President. Delivered at the Annual Meeting of the Academy held January 7th, 1937.

tion is already so notable that the look ahead opens up vistas so promising that they are truly exciting. When we stop to realize that practically all that we today count as scientific medicine has developed within the span of the generation still alive, the possibilities of its future development cannot fail to grip the imagination.

Our entire knowledge of the bacterial origin of many infectious diseases has come since 1870, and the practical application of this knowledge came only after the turn of the present century. These few short years have sufficed to give us virtual control of diphtheria, of typhoid fever, of yellow fever, of malaria, of hookworm disease, of the acute intestinal diseases of children, and the dysentery of adults, to mention only some of the outstanding examples. Through the removal of the dangers of infection this same knowledge has made possible the extraordinary development of modern surgery. More recently has come also the better understanding of vitamin deficiency diseases, of blood disorders, and of the disturbances of the organs of internal secretion. Technical scientific advances have also made possible many instruments of precision useful in the diagnosis and treatment of disease, such as the Roentgen ray, the electrocardiogram, and numerous applications of chemistry to clinical medicine, both in diagnosis and in treatment. The whole field of the pathology of function, supplementing our previous too exclusive devotion to the study of the pathology of structure, has been opened up to the great advantage of many branches of medicine and of surgery. We stand at the brink of more exact knowledge of metabolic disease, of respiratory affections, of numerous virus diseases and even have hopes that before long, dreaded cancer itself may yield up its secrets to the methods of modern research.

Notable names flash across our memory associated with these extraordinary achievements. Pasteur, Koch, Behring, Roentgen, Welch, Walter Reed, Trudeau, Banting, Minot, to mention only a very few. It is no wonder that the imagination of young students and practitioners of medicine is fired by a zeal to emulate their great achievements, to



share in extending still further the boundaries of our knowledge and to help to conquer some of the innumerable problems which still lie before us. Such an ideal is indeed a noble one, a challenge to the very best, but to the medical profession of today as a whole it is not enough, far from it

### THE CLINICAL IDEAL

This we may characterize as the Art, as distinct from the Science, of medicine. Already we hear murmurings that we are in danger of losing this Art, that the startling progress of scientific medicine has in itself contributed to this direction. That we are thinking too much of our patient as an organism rather than as an individual, as a personality. That this has led to too great reliance upon the laboratory and upon scientific instruments of precision, and away from the personal equation of the individual as a whole, his psychic and emotional as well as his physical and physiological reactions to his environment as well as to his disease. That specialized practice restricted to one organ or to one group of organs, and even surgery itself, tend in the same direction.

The often expressed regret of the passage of the general practitioner is not confined to the laity. It is quite as common within the medical profession. In fact, the tendency to get back to the better appreciation of individual and personal relationships in medicine is quietly gathering strength in a manner which may have a deep influence upon the future practice of medicine. In some countries, notably Italy, France, Germany and England, this movement has been dignified with a name. It is being discussed under the designation of "Neo-Hippocratism." Appreciation of the significance of this term requires a short excursion into medical history.

Hippocrates, known as the father of medicine, lived in the fifth century B C, the age of Pericles and the acme of Greek culture. With little or no scientific knowledge he established a system for the diagnosis and treatment of disease, based upon careful and accurate clinical observation. He insisted upon the fundamental importance of the knowledge of the constitution and of the nature of each

patient, as he expressed it "The physician must know a man's nature and a man's behavior through life in relation to all his actions" Thus, he established the supreme importance of personality and of personal relations

From the point of view of the physician, Castiglioni has recently summarized the Hippocratic doctrine in masterly fashion as follows "The physician's task of speculation and of observation, an artist's task, is insisted upon in all the works of the Master A very good physician is a very good philosopher, that is to say, a man who can perfectly judge and reach right conclusions Diagnosis and prognosis may be taught by the Master, that is stated in the Hippocratic texts, but the patient's treatment, the behavior at the patient's bedside, the therapeutical intervention, cannot be taught In determining them the artist's qualities are revealed Hippocratic medicine is individualistic because it admits the importance of the physician's personality Moreover, it establishes the basis of professional practice the physician's faith in his art, together with the right appreciation of its limitations"

In 150 A D, six centuries after Hippocrates, came Galen, the next outstanding leader of medical thought Although Greek in origin, his ideas developed in the environment of Rome Galen's doctrine, though based upon that of Hippocrates, developed the analytical method, the study of specific diseases of specific organs, and the application of specific remedies One finds little mention of constitution or of personality in the teachings of Galen, and dogmatism replaces philosophy Galen completely dominated medical thinking, such as it was, for more than sixteen hundred years A gradual release from this subjugation appeared in the 17th century with the beginnings of independent medical observations and ideas, and was contemporaneous with similar movements in other fields, the Revival of Learning, the Reformation in Religion, and the Renaissance in Art

By painfully slow steps progress was made during the intervening centuries until our own, with the influence of Galen unconsciously persisting, until, in the latter part of the 19th century, the rapid development of scientific knowl-

edge in itself produced a definite reaction back toward the Galenic ideas of specific diseases for specific organs. This was definitely expressed by Vuchow, in 1902, when he said, with the weight of his great scientific reputation behind him, "There are no more general diseases but only diseases of the organs and diseases of the cells."

Neo-Hippokratism is the counter-reaction against this tendency. It voices a call to go back and sit at the feet of the ancient master. To think of man as a whole, of his constitution and his nature. To consider disease as a disharmony of normal relations, as disturbance of function as well as of change in structure, to consider the emotional and the psychic as well as the physical and to bring back personality as expressed both in patient and in physician, as a determining factor in successful treatment. This is a challenge to modern clinical medicine. Far from excluding the advances of science from its purpose, it eagerly grasps each new discovery as an increased opportunity for usefulness, but translates science into terms of a personal equation applicable to individuals by individuals. The great masters in clinical medicine knew and employed these methods, Sydenham, Heberden, Laennec, Watson, Abernethy, Osler, Trudeau, Gienfell, Delafield, and Janeway. The memory of great names in medicine such as these reminds those of us who were not born to be scientists, that we may still hold up our heads as worthy of the name of physician if we follow the same ideals as they. But let us do so in humility as well as in pride, keeping in mind that most famous of the aphorisms of Hippocrates:

"Life is short, the Art long, opportunity fleeting, experience treacherous, and judgment difficult."

### THE ETHICAL IDEAL

The father of medicine did more than give us the first firm basis for clinical medicine, he gave us the first principles of ethics for our profession, crystallized in the Hippocratic oath to which we have all subscribed. The term medical ethics does not represent simply a code of honor between physicians, a sort of gentlemen's agreement, and it certainly is not, as some have assumed, a defensive

coloring designed mainly for our own self protection. It means rather an oath of allegiance to ideals of professional contacts in our relations to each other, to our patients and to the public. It is the concrete expression of the responsibilities of our calling, sacred in the sense that we may hold in our hands the power over life and death. It is the dedication of our knowledge, our powers and our gifts to the service of others rather than to the hope of reward for ourselves.

In these troubled days when the forces of materialism have grown great about us, the road is not easy. Temptations to self-interest, to carelessness, to sharp practices or even to those that are frankly unethical, often beset us. These can only be overcome by a devoted adherence to those ideals which, though Hippocratic in origin, are really spiritual in their essence. This requires persistent effort to develop, through all of our professional contacts, that sympathetic understanding of ourselves, our fellows and our patients which makes for integrity of character and for the true expression of that rare gift of God, personality. This is truly the power of the Spirit, against which mere material forces will break in vain.

#### COMMUNITY RESPONSIBILITY

As the pursuit of our scientific and clinical ideals has tended to make our profession individualistic in its approach to medical problems, it has also tended to make us more or less forgetful of other important responsibilities. During recent years the practical application of our growing medical knowledge has become increasingly evident to the world at large, and is now recognized as possessing great significance for the community as a whole. This has resulted in a demand for an extension of our activities far beyond the intimate personal relationships between individual physician and patient, to those broader fields which we designate as social and preventive medicine.

In social service we are gradually coming to appreciate that a study of the living, working and economic conditions with which our patients are surrounded, often illumines difficult clinical pictures and may point the way toward

proper and adequate treatment. Also we are beginning to realize that by increasing our knowledge of community activities in social, economic and industrial fields, we immeasurably broaden our horizon of interest and of culture and thus become not only better physicians but better citizens. This leads us directly into the field of preventive medicine, for by the very fact that we are uncovering the causes of illness we become responsible for the attempt to prevent its occurrence in others. It, consequently, becomes an important part of our job not only to treat people when they are sick but also to help keep them well, and thus we reach out from the bedside, to the family, to the various social groups and to the community. This part of our task brings us closely in contact with public health agencies with which we must cooperate closely in their effort to improve the health of the community. What a wonderful power we, as a body, could exert in this field if each physician constituted himself a health officer for the families under his care, detecting and correcting physical defects, following up sources of infection in syphilis, in diphtheria and other communicable diseases, following up the contacts in cases of tuberculosis, and in general in every way cooperating closely with our public health authorities in the effort to prevent disease! The record of accomplishment in this field is imposing, but as long as thousands still die each year from diseases which we know to be preventable, we must continue to increase our efforts. Government, health authorities and other organized health agencies can do much, but individual physicians, if their efforts are properly directed, can do even more. The prevention of disease, therefore, becomes a challenge of the future to our profession, an ideal to which we must aspire.

#### THE ACADEMY OF MEDICINE

Now, the New York Academy of Medicine is organized to foster all of the professional ideals which we have been considering. Higher standards of scientific and clinical medicine are promoted by our splendid Library which is available to all members of the profession and to the general public. Our section and general meetings afford a forum

for the free discussion of all phases of medicine, and our Committee on Medical Education is assiduously developing the wider use of the opportunities for graduate instruction, and specifically through the Graduate Fortnight each year a symposium on special topics is arranged which has proven a most useful and popular institution. Also, many of the important papers presented before the Academy are published in our monthly bulletin. So that, taken all together, the Academy represents one of the most important institutions for postgraduate education in this city and indeed in the whole country.

The maintenance of high standards of ethics is the constant concern of the Council, of the Committee on Admission and of the Committee on Professional Standards. Also, through the Academy the relations of the medical profession with the general community have been developed to a remarkable degree during the past twenty-five years. The Committee on Public Health Relations has established intimate contact with all aspects of community life which touch upon health and general welfare, and it has become the close adviser of the city Departments of Health, of Hospitals, of Welfare, of Education, of Sanitation, and of Civil Service.

Through our Medical Information Bureau we act as interpreters of current medical knowledge to many individual inquirers but especially to the press and to the public, and we have carried out many independent studies and surveys in the field of public health. The Academy publishes a monthly magazine devoted to preventive medicine for physicians, and through the course of Lectures to the laity we have done much to popularize sound medical knowledge. Through cooperation with the organized county and state societies the Academy has constantly attempted to guide the trends of medical practice within the range of economics, of social welfare and governmental relations, into sound channels which, while protecting the rights and standards of the medical profession, are primarily designed to promote the best interests of the community as a whole.

With this cursory review of the record of achievement behind us, we who are Fellows and Members of the Academy have a responsibility to maintain and to advance our medical ideals, which is even greater than that which devolves upon the profession as a whole. We of the medical profession have a noble heritage, and we of the Academy have an especially notable tradition. These constitute a challenge to the future that we should hold true to our ideals of service, with hopes of any reward as a secondary consideration. Those of us who, for a passing period, are charged with the responsibility of guiding the counsels of the Academy of Medicine pledge ourselves to give the best of our thought and energy to this end. We do so unhesitatingly because we are confident of your support.

Quite recently I had occasion to quote from the address of Doctor Trudeau to which I have already referred. I beg your indulgence if I repeat these words here, for they express far better than any at my command the spirit of the ideas which I have attempted to convey.

At the conclusion of that address Doctor Trudeau left this message which I in turn would like to leave with you:

"Let us not", he said, "Let us not, therefore, quench the faith nor turn from the vision which, whether we own it or not, we carry, as Stevenson's lantern-bearers their lanterns, hidden from the outer world, and, thus inspired, many will reach the goal, and if for most of us our achievements inevitably must fall short of our ideals, if when age and infirmity overtake us 'we come not within sight of the castle of our dreams,' nevertheless all will be well with us for, as Stevenson tells us rightly, 'to travel *hopefully* is better than to arrive, and the true success is in labor

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# MEDICINE AND THE STATE\*

THOMAS D. IHACHIER

Chairman of New York City Charter Revision Commission

The accomplishments of medical science are among the wonders of the modern world. It is, however, one of the ironies of fate that your profession, which above all others has taught the world the value of scientific research, should at a time when the discoveries of medical science have so miraculously relieved mankind of so many ills be made the victim of erroneous conclusions drawn from research of another sort. You have been put through the ring of statistical analysis and sociological research, and have come out drenched with printer's ink, confused and harassed by discordant voices contending in continuous debate over socialized medicine under a compulsory system of health insurance. After such an experience what you need most is a bath, a rest, and a little quiet thought.

Those who agitate socialization of medicine rely upon facts disclosed in the Report of the Committee on the Costs of Medical Care to support proposed remedies which the Committee itself rejected. Because these advocates are able to cite the Report on the facts their proposals appear to those who have not read the report to be the result of careful scientific study. The fallacy which underlies these proposals is in most cases traceable to generalizations which in any scientific consideration of facts would be ruled out at once. To put it concretely, figures indicating averages for the whole of the United States are made the basis for the universal application of a single remedy without consideration of the local conditions under which it is to be applied. This is a peculiarly erroneous method of thought, and an extraordinarily dangerous method of action. It has often characterized sociological as distinguished from scientific research.

The accomplishments of science have been so startling, and so incomprehensible to the unscientific mind, that we are apt to wonder and applaud when one who calls himself

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\* Delivered at the Annual Meeting of the Academy held January 7, 1937



a scientist speaks His authority has become so great in the eyes of an admiring public that we permit him to do our thinking for us So far as the physical sciences are concerned that is safe enough, for the experimental data is always at hand and the conclusions are always subject to verification Generalizations are rarely permissible These are the sciences in which wonders, amazing to the world, are so rapidly being disclosed by careful scientific research During the years following the great war the idea that research, so successfully applied in the study of physical characteristics of the individual, could with equal success be applied to the study of society was generally accepted, with the result that statisticians and sociologists were for several years continuously employed in all sorts of research projects covering pretty much the entire gamut of human relations The rage became a fever The Universities through their separate departments competed in devising projects which might appeal to the Foundations for support The Foundations were impressed with the same idea and gave generously of their funds in support of such projects Much good has come, and will come, to society from these activities They result in disclosing sociological facts, data and materials which when properly used may lead to sound conclusions upon social and economic problems For instance, the effect of environment upon the individual may in some cases be judged with some accuracy but no conclusions may be safely drawn unless all of the human factors directly affecting the particular situation are understood and accurately appraised Even such conclusions have no such verity as the conclusions of purely scientific research At best they can only be proven by a process of trial and error, and when one is dealing with the welfare of mankind it is far better to preserve the institutions which have been proven by experience than to substitute novel and untried plans unsuited to the needs and habits of the community

I emphasize the distinction between the purely scientific approach of your profession and the pseudo-scientific approach of the Sociologist, because if we are to consider

the proposal that medical care of the American people shall be entrusted to government, it is necessary, to avoid the generalizations which seem to have been blindly accepted in much of what has been published on the subject. The Committee on the Costs of Medical Care considered the problem of providing satisfactory medical service to all the people of the United States at costs within their reach and adequate to compensate the service. In its recommendations a majority of the Committee said

"The problem is complicated, and differs from one region to another. No panacea is available. No solution is applicable today to all areas of the country. Americans are prone to think of the United States as comparable to such nations in western Europe as France, England, and Germany. Actually this nation more nearly resembles the continent of Europe as a whole, it has prosperous rural regions like Denmark, closely knit industrial districts like Belgium, and mountainous and desert regions which present social and economic questions almost as difficult as those found in a Balkan Province."

Thus this Committee did not attempt to impose upon the United States, or upon any community within the United States, a preconceived plan for the reorganization of medical service. On the contrary it pointed out the extraordinary accomplishments in the advance of medical science, and the needs of the profession and of the people which should be met in a process of evolution by which the members of your profession could more effectively serve the people and be more adequately paid for your service. It dealt with ultimate objectives, and with the utilization and perfection of present resources in the attainment of these objectives. There were minority reports, one group apparently not being willing to go as far as the majority and others wishing to go further and to recommend a compulsory system of health insurance.

Following the publication of the report there has been continuous debate which has centered very largely upon the question of socialized medicine under a system of compulsory health insurance. Those who support this

measure do so wholeheartedly, and would have the system adopted in every state without regard to local conditions or existing institutions. To be compulsory such a plan must have the force of law. It may only be authorized by state legislation. Ordinarily a State Legislature will and must have regard for local conditions and local institutions. If, however, the Federal Government, following the pattern of the Social Security Act, should provide Federal appropriations in aid of compulsory health insurance, provided for under state statute, pressure upon the Legislatures of the States to set up such systems at the cost of the Federal Government might very well result in such enactments without due consideration of the local institutions and the local needs.

Serious question would certainly be raised as to the constitutional validity of such laws if they are made compulsory, and if there is discrimination in the cost of such insurance as between those in the upper and those in the lower income brackets. It is a great temptation to be charitable with other people's money, but the Constitution denies that privilege to the Legislature, although this limitation may sometimes be avoided through an exercise of the taxing power. Certainly the states have no power to enforce a sliding scale, or to take the money or property of the rich and give it to the poor. Generosity in relieving distress is characteristic of our people, and peculiarly characteristic of your profession. But we prefer to do our own giving.

In the heat of this controversial debate there are those who have severely criticized you, and all your works, in the face of one of the greatest accomplishments in the service of mankind, and have scorned your service to the poor as charity, asserting it to be the right of every man to have free medical care if he be unable to pay for it. In a perfect state no one would deny that right. In no state has the duty to provide such care been more universally recognized by government than in the United States. The services of all our great hospitals, dispensaries, clinics, health stations and maternity centers, with all their equipment and tech-

nique, are available to the poor of this city. In addition medical and nursing care is furnished in the home without cost to WPA workers and to those on home relief. Wherever such facilities and services are established they are made available to those who cannot afford to pay for them if they are within the communities served.

It is true that there are over five millions of people living in the mountains of the South beyond the reach of medical or nursing care and there are millions more in other places in this country. The reason is economic. Few families in those remote Southern mountains receive in the aggregate more than \$100 a year in cash. Their children are born without medical or other care. In Kentucky there is the Frontier Nursing Service, supported by charitable gifts. In North Carolina, under the Farmers Federation, through cooperative efforts these people have set aside a portion of their lands and the products thereof to provide for the services of community nurses. Contrast the problems of the millions of people living in remote rural communities with the problems of millions of people living in the City of New York. Such problems will not be solved by preconceived plans predicated upon statistics and averages drawn from all over the United States. They will only be solved by an intensive study of all the social and economic elements affecting human welfare in particular communities. From the standpoint of the service it renders your profession may not be regarded as a single unit coterminous with the boundaries of the country. In every hamlet, town, village and city throughout the land the members of your profession are confronting with intelligence the local problem of adequate medical care for the individual men, women and children who live within the community they serve. Your remedies are not prescribed for the mass, but for the individual. If Legislative remedies dealing with diverse needs and conditions are necessary they must be prescribed in the same way. We need more of your practice in legislation, and less legislation in your practice.

The fact is that we have made progress in the past, and will only make progress in the future, by being sensitive

to the needs of our neighbors and dealing objectively with their problems as they are known to us. We need no panaceas. We need all the devices and all the methods which any community may find desirable in the interest of all its people. If we subject the interests of our neighbors to compulsory plans the pattern of which must be approved by Federal authority and enacted into law by the State, the people will languish, the members of your profession will become public servants, constrained and limited by laws and regulations, infected with the virus of public employment, insensitive to private and public need.

If you were insensitive to such needs the rigid pattern of state medicine might well be regarded as the only measure to meet the present needs. But when those needs are being met voluntarily by the growth and development of medical service, and by thoughtful consideration of the defects in the system which are pointed out in the Report of the Committee on Costs of Medical Care, it would seem to be a council of despair to embrace state medicine as the cure for all our ills.

There are involved in these problems really two conflicting considerations. The inadequacy of medical care available to large portions of the population, and the inadequacy of compensation for medical service rendered by the members of your profession. The latter consideration presents problems of great hardship. No profession has suffered more during the depression, and it has suffered not for its sins but for its virtues. The development of medical science has enormously increased the cost of medical care, and has led to the division of your ranks between general practitioners and specialists. So far as you have been able you have applied with generous self sacrifice the rule of your profession that the poverty of a patient should command the gratuitous service of a physician. The depression has swept away the income of the neighborhood doctor because it has impoverished his patients. Until quite recently W P A workers have been furnished free medical care by W P A physicians and those on home relief have been furnished medical care

under the panel system I note that the latter system is now to be adopted for W P A workers, and it is to be hoped that this will afford some measure of additional income to the private practitioner

One can understand with sympathy why many members of your profession support a plan of compulsory health insurance, which they are told will enable them to become insurance practitioners and thus receive modest compensation for permanent employment. When they find other agencies of the state and of the nation invading the field of private practice they have reason to insist that the state provide a system under which the community will be compelled to bear the cost of adequate medical service. The economic problems of your profession are acute and compelling. If they could be solved tomorrow by the enactment of sound legislation, such legislation should receive instant support. I venture to believe that these problems, so far as they are susceptible of solution, will be solved by recovery before such laws could be enacted and put into effective operation.

Out of these problems there has arisen an insistent demand by a large number of your profession that those of you who serve in the municipal hospitals, in whatever capacity, should be paid adequately for your service which you have so generously given without compensation in the past. Here again we are confronted with an economic barrier. These services in the aggregate amount to six or seven million days of care per annum, and at only \$3 a day the cost would be approximately twenty million dollars and would double the budget appropriations for our hospitals. The prohibition in the old Charter against the payment of any members of the staff has been removed, except that members of the medical staff who are serving as members of the in-service of the hospital as part time clinicians may not be compensated for service in the wards of the hospital except in compensation cases. Within this limitation, certainly the city, so far as it is able, should relieve the hardship of those who are serving without compensation in the city hospitals.

Upon the question of adequate care government has certainly done much to provide medical care for the indigent in New York City. We have seen, however, during the depression, a crowding of the city hospitals and vacancies in the voluntary hospitals. This presents a problem of cooperation and organization. The formation under the present City Administration of a Hospital Council, representing the voluntary and public hospitals of the city, is the first attempt to coordinate their activities. In this Council representatives of your profession are actively participating with the city so as to avoid the duplication of unnecessary facilities, to use to capacity the existing facilities, and to provide additional facilities when necessary. The city itself is giving generous support by appropriation from its revenues to the voluntary hospitals. There has been no attempt upon the part of the city to control the administration of the voluntary hospitals, notwithstanding these large appropriations, but there is every reason to believe that through cooperation and support the services rendered by the municipal and the voluntary hospitals may be so coordinated as to be of the greatest possible service to all of the people of this city. The voluntary hospitals can do much to aid private practitioners by making available to their patients at moderate fees the services of their staff for consultation. This plan has been tried with success at Mt Sinai, and has greatly relieved the burden of cost upon those who are able to employ the services of a family physician but are often unable to pay specialists for consultations.

Through cooperative effort the Associated Hospital Service is extending its plan of voluntary insurance to meet the cost of semi-private hospital care. This plan should be of incalculable value to the same class of patients, and indirectly it should unquestionably benefit private practitioners whom they employ. The American Hospital Association is actively advising local communities throughout the country in regard to their problems of medical service and medical care. This Association maintains an Executive Secretary in the field and under a grant from the Rosen

wald Fund has been instrumental in establishing the Group Plan for meeting the cost of medical care in many communities throughout the United States. These and many other activities of your profession are but examples of your constant activity in the public service and of your sensitiveness to the public need. One cannot doubt that these needs will be more adequately met through measures prompted by such voluntary activities undertaken with intimate knowledge of local conditions than they will by compulsory plans imposed by state legislation prompted by Federal grant.

There is difference of opinion among the members of your profession as to the proper scope of the activities of existing governmental agencies. No doubt some of the activities of the Department of Public Health of this city have invaded the field of private practice. They have been justified as serving the ends of preventive medicine, a field of endeavor which is too little developed in this country. No doubt the building of Veterans Hospitals in every state of the Union, and the care in these hospitals of veterans who are not suffering from service connected illness or injury, has been regarded as an unwarranted invasion of private practice. The hospitalization program of the Veterans Administration contemplates the hospital care of veterans needing treatment for service connected diseases or injuries, and of veterans needing hospitalization for conditions not service connected whenever such veterans are unable to pay for such care. No one, I think, can fairly object to this policy of the Federal Government. Certainly veterans should be provided with free medical service made necessary by service connected diseases or injuries. If hospitalization were not provided in other cases to veterans unable to pay for such care, these veterans would be a charge upon the local communities and would be cared for at local expense if facilities for their care were available.

But whatever view may be held of the extension of medical service afforded by agencies of the Federal, State or Municipal Government, it is entirely clear that it is



neither expedient nor wise to oppose such extensions as may clearly be justified in the service of the public. The primary problem is one of meeting more adequately the need for medical care. If the medical profession stands against the extension of facilities necessary in the public interest it will inevitably be regarded as influenced by selfish professional motives. It has never been so regarded in the past. It could not be today. It has a great opportunity in continuing to serve, as it has so gloriously served in the past, upon a front as wide as the country itself, whose people in every hamlet, village, town and city are now turning to you not only for relief in time of illness and misfortune but for the solution of the problem so vital to their welfare, of providing in advance for the adequate care of those who fall sick, regardless of ability or inability to pay for such service. They need your leadership and guidance in the initiation of measures suited to their particular needs. You have taken such leadership into your hands. I can not doubt that you will solve this problem without submitting your profession to regimentation and control by political authority.

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### CORRECTION

On page 550, 12th line from the bottom, of vol 12, no 10, October 1936, issue of the *Bulletin*, the date "1799" appeared in error. The correct date is "1797".



## 1 THE RELATION OF LABOR TO INTRACRANIAL INJURY IN THE PREMATURE INFANT

WILLIAM E. STUDDIFORD AND HIRAM P. SALTER

A series of twenty cases of intracranial injury in infants born at full term is compared to a series of thirty-eight cases of intracranial injury in premature infants. The characteristics and mode of production of these injuries are pointed out in both groups. A series of 249 premature labors were studied as to length and as to the technique of delivery. It was found that the incidence of injury in the primiparous appeared to be related to duration of labor and premature rupture of the membranes. Such a relationship was not manifest in the multiparous. A second stage, shortened either by episiotomy alone or episiotomy with forceps, gave the best results particularly in first-born infants. To minimize such injuries, the following procedures were suggested: avoidance of induction of labor prematurely, either because of borderline pelvis or because of premature rupture of the membranes; termination of the second stage by low forceps and episiotomy in all cases in whom the perineal structures offered any degree of resistance; avoidance of all efforts to manually restrain the delivery of the premature head.

## 2 THE CHICAGO CITY-WIDE PLAN FOR THE CARE OF PREMATURE INFANTS

JULIUS H. HESS

Instituted in 1935, by the Chicago Board of Health, it is based on plans adopted at the premature stations at Sarah Morris, and Cook County hospitals.

A reduction in morbidity and mortality rates among prematurely born infants seemingly offered a promising field for lowering the death rate among new-born infants. It was felt that if the principles established in conducting the stations at these hospitals could be applied in a city wide program, many premature infants now lost, might be saved.

An outline of what a station should offer was presented, including ambulance service, ward care with equipment for oxygen and emergency therapy, nursing service, breast milk, wet nurses, field nursing service, simple type of heated bed, and outlines for out patient clinic. Emphasis was placed on the importance of a clear understanding of the care of the premature infant, especially in such matters as maintaining proper temperature, the treatment of cyanosis and knowledge of feedings.

Adequate antepartum care of the mother is of very great importance. This is proven by the number of cases of premature delivery in which pelvic deformity, placenta praevia, toxemia, cardiac conditions and syphilis contributed to premature delivery.

Equally good results may be obtained through the home care of premature infants if the main features of this plan are carried out.

- Neveu-Lemaire, M *Traité d'helminthologie medicale et vétérinaire*  
Paris, Vigot, 1936, 1514 p
- Price, C S *The improvement of sight by natural methods* 2 ed  
London, Chapman, 1936, 239 p
- Read, B E *Chinese medicinal plants from the Pen ts'ao kang mu* 3 ed  
[Peiping], Peking Natural History Bulletin, 1936, 389 p
- Reichborn-Kjennerud, I, Grøn, A F and Kobro, I *Medisins historie*  
1 Norge  
Oslo, Grøndahl, 1936, 328 p
- Saphir, O *Autopsy diagnosis and technique*  
N Y, Hoeber, 1937, 342 p
- Scott, D H *Your child's health*  
London, Muller, [1936], 203 p
- Scoville, W L and Powers, J L *The art of compounding* 6 ed  
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Ann Arbor, Wahr, 1936, 64 p
- Shryock, R H *The development of modern medicine*  
Phil, Univ of Penn Press, 1936, 442 p
- Sinclair, C G *Microbiology and elementary pathology, [For nurses]* 3 ed  
Phil, Davis, 1936, 377 p
- Smillie, W G *The common cold*  
N Y, Funk, [1937], 77 p
- Sucharda, E and Bobranski, B *Semimicro-methods for the elementary  
analysis of organic compounds*  
London, Gallenkamp, 1936, 52 p
- Techniques chirurgicales, publiées par A Gosset*  
Paris, Masson, 1936, 433 p
- Titus, P *The management of obstetric difficulties*  
St Louis, Mosby, 1937, 879 p
- Tow, A *Diseases of the newborn*  
N Y, Oxford Univ Press, [1937], 477 p
- Wallis, T E *Practical pharmacognosy* 3 ed  
London, Churchill, 1936, 226 p
- White, J M *Health and environment, the elements of sanitary science*  
Phil, Davis, 1936, 209 p
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N Y, Macmillan, 1937, 744 p
- Williams, J F *Exercise and health*  
N Y, Funk, [1937], 70 p
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Wien, Sensen-Verlag, [1936], 215 p
- Wood, H C, LaWall, C H, Youngken, H W [et al] *The dispensatory  
of the United States of America Centennial (22nd) ed*  
Phil, Lippincott, [1937], 1894 p

# PROCEEDINGS OF ACADEMY MEETINGS

## FEBRUARY

### STATED MEETINGS

February 4

- I EXECUTIVE SESSION—*a* Reading of the Minutes *b* Election of Trustee and Member of Committee on Library
- II PAPER OF THE EVENING—A tuberculin survey of the Upper Aucaner Bush Negroes in Dutch Guiana and the bearing of this survey on tuberculosis mortality among Negroes in other regions (Illustrated with motion pictures) Morton C Kahn Associate Professor of Public Health and Preventive Medicine Cornell University Medical College
- III REPORT ON ELECTION OF MEMBERS

THE HARVEY SOCIETY (IN AFFILIATION WITH THE NEW YORK ACADEMY OF MEDICINE)  
February 18

THE FIFTH HARVEY LECTURE The Scientific Work of the Health Organization of the League of Nations Thorvald Madsen Director Serum Institute Copenhagen Denmark

### SECTION MEETINGS

SECTION OF DERMATOLOGY AND SYPHILOLOGY—February 2

- I READING OF THE MINUTES
- II PRESENTATION OF CASES—*a* The Mt Sinai Hospital *b* Miscellaneous Cases
- III DISCUSSION OF SELECTED CASES
- IV EXECUTIVE SESSION  
Examination of cases is limited to members and their invited guests

SECTION OF SURGERY—February 5

- I READING OF THE MINUTES
- II PRESENTATION OF CASES—*a* Complete thyroidectomy for cardiac disease Follow up result Edward L Kellogg Discussion by James A McCreery *b* Paravertebral dorsal ganglion block for cardiac pain Milton C Peterson (by invitation) *c* Complete thyroidectomy for cardiac disease Follow up result Denervation of thyroid gland Result Carnes Week Discussion by William B Parsons
- III PAPER OF THE EVENING—Recent developments in surgery of the heart Claude S Beck Lakeside Hospital Cleveland (by invitation) Discussion by William B Parsons
- IV GENERAL DISCUSSION
- V EXECUTIVE SESSION

SECTION OF NEUROLOGY AND PSYCHIATRY—February 9

- I PRESENTATION OF CASES—*a* An unusual case of intra cranial aneurysm clinical and pathological demonstration Irving J Sands Discussion E D Friedman Israel Strauss *b* German measles encephalitis Louis Friedfeld (by invitation) Charles Davison Discussion Armando Ferraro E D Friedman, M Neustaedter H A Riley
- II PAPERS OF THE EVENING—*a* Defects in one field of vision as an early sign of tumor involving the optic radiation Morris B Bender (by invitation) Israel Strauss Discussion Joseph H Globus Donald G Marquis (by invitation) *b* A study of fifty cases of bromide psychoses Frank J Curran Discussion Leland E Hinsie *c* Sigmund Freud as a neurologist Smith Ely Jelliffe Discussion Kurt Goldstein (by invitation)

JOINT MEETING OF THE SECTION OF OBSTETRICS AND GYNECOLOGY AND  
THE SECTION OF PEDIATRICS—February 11

- I PAPERS OF THE EVENING—*a* The relation of labor to intracranial injury in the premature infant William E Studdiford Hiram P Salter (by invitation) Discussion by Eugene S Coler Stewart H Clifford Boston (by invitation) S J Scadron Morris

TRACY, WILLIAM DWIGHT, D D S, 2 East 54 Street, New York City, graduated from the University of Pennsylvania Dental School with the degree of D D S in 1896, elected an Associate Fellow of the Academy January 6, 1927, died February 11, 1937

Dr Tracy was director of the Dental Clinic at the New York Nose, Throat and Lung Hospital from 1905-15, president of the First District Dental Society from 1915-16, director of operative dentistry at Vanderbilt Clinic from 1914-17, director of dental service of Presbyterian Hospital from 1921-1932, chairman of the community dental service committee of the New York Tuberculosis and Health Association from 1926-33 and professor of operative dentistry at the Columbia University Dental School from 1929-32. He had been a trustee of the University of Pennsylvania since 1932, a director of the Tuberculosis and Health Association since 1926, and on the dental advisory committee of the city Board of Health for the past eleven years

VAN WAGENEN, CORNELIUS DOREMUS, A B, A M, M D, 667 Madison Avenue, New York City, received the degrees from Princeton University of Bachelor of Arts in 1889 and Master of Arts in 1892, and graduated in medicine from the college of Physicians and Surgeons in 1893, elected a Fellow of the Academy January 4, 1906, died March 5, 1937

Dr Van Wagenen was assistant otolaryngologist to the Manhattan Eye, Ear and Throat Hospital and consulting otolaryngologist to the Seton Hospital

He held a certificate from the American Board of Otolaryngology and was a Fellow of the American Medical Association and a member of the County and State Medical Societies

WIENER, RICHARD GEORGE, A B, A M, M D, 145 West 58 Street, New York City, graduated in medicine from the College of Physicians and Surgeons in 1878, elected a Fellow of the Academy March 1, 1883, died February 8, 1937

Dr Wiener was visiting physician to the Harlem Hospital from 1898-1916 and consulting physician to that institution from 1916-1930. He was a member of the American Medical Association and the County and State Medical Societies



## PARTIAL LIST OF ACADEMY STAFF

1936

### ADMINISTRATION

JOHN A HARTWELL, *Director*  
PRISCILLA A SPROULL *Secretary*  
ARTHUR A EBERLE, *Comptroller*  
CAROLINE GOLDHAMMER, *Room Reservations*  
JOE FINNAN, *Building Superintendent*

### THE LIBRARY

ARCHIBALD MALLOCH, *Librarian*  
JANET DOE, *Assistant Librarian*  
FRANK PLACE  
CHARLES F SMITH                      } *Reference Librarians*  
FLORENCE DUVAL, *Head of Cataloging Department*  
SARAH S WILSON, *Head of Periodicals Department*  
HELEN SAYER, *Head of Bibliographical Department*  
GERTRUDE L ANNAN, *In charge of Rare Book and History Room*

### STAFF OF COMMITTEES

#### *Committee on Public Health Relations*

E H L CORWIN, *Executive Secretary*  
OLGA A KRUESI, *Secretary*  
ALICE E PAULSEN, *Executive Assistant*

#### *Committee on Medical Education*

FREDERICK P REYNOLDS, *Medical Secretary*  
GRACE JOHNSON, *Secretary*

#### *Medical Information Bureau*

IAGO GALDSTON, *Executive Secretary*  
HENRIETTA SIMMS, *Secretary*

# STANDING COMMITTEES OF THE ACADEMY 1936

## COMMITTEE ON ADMISSION

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CONNIE M GUION, <i>Secretary</i>	HARRISON S MARTLAND
WILLIAM R BRANDON	HOWARD FOX
GUILFORD S DUDLEY	GEORGE W FISH
PAUL SIELDON	ROBERT E POUND
HOWARD C TAILOR, Jr	S BERNARD WORTIS

## COMMITTEE ON LIBRARY

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FENWICK BEEKMAN, <i>Secretary</i>	SAMUEL W LAMBERT	PEYTON ROUS
HOWARD REID CRAIG	WALTON MARTIN	ALLEN O WHIFFLE
RANSOM S HOOKER	ELI MOSCHCOWITZ	

## COMMITTEE ON PUBLIC HEALTH RELATIONS

\*JAMES ALFANDER MILLER, *Chairman*

ALBERT H ALDRIDGE	*CONNIE M GUION
*HARRY ARANOW	ROBERT LE ROY HUTTON
*GEORGE BAFER	*GEORGE W KOSMAK
CONRAD BERENS	*SHEPARD KRECH
FRANK B BERRY	ADRIAN V S LAMBERT
ERAST P BOAS	CHARLES A MCKENDREE
CARL BOETTICER	HARVEY B MATTHEWS
*HENRY W CAVE	JOHN R RANDALL
HUGH CHARLIN	J STURDIVANT READ
LEON H CORNWALL	HENRY ROTH
*STUART L CRAIG	BERNARD SACHS
KIRBY DWIGHT	*JAMES RALPH SCOTT
*HAVEN EMERSON	GRANT THORBURN
HOWARD FOX	NATHAN B VAN ETEN
LEWIS FOX FRISSELL	DAVENPORT WEST
*MALCOLM GOODRIDGE	*HERBERT B WILCOX
DAVID GREENBERG	*I OGDEN WOODRUFF

E H L CORWIN, PH D, *Executive Secretary*

## COMMITTEE ON MEDICAL EDUCATION

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FREDERIC W BANCROFT	HARRY P MENCKEN
F WARNER BISHOP	JOHN J MOORHEAD
RALPH H BOOTS	HERMAN O MOSENTHAL
MERIDITH F CAMPBELL	BERNARD S OPPENHEIMER
ARTHUR F CHACE	WALTER W PALMER
LLOYD F CRAVER	EDWIN G RAMSDALL
CONDUCT W CUTLER, Jr	WILLARD C RAPPLEYE
CHARLES A ELSBERG	PAUL REZNIKOFF
SAMUEL J KOPETZKY	HOWARD F SHATTUCK
WILLIAM S LADD	CHARLES F TENNEY
EMANUEL LIDMAN	GEORGE GRAY WARD
THOMAS T MACKIE	CARNES WEEKS
WILLIAM F MACFEE	WEDD W WEEKS
	JOHN WICKHOFF

FREDRICK P REYNOLDS, *Medical Society*

## COMMITTEE ON SECTIONS

WALTER L NILLS, *Chairman* and The Chairmen of Sections

## COMMITTEE ON FELLOWSHIP

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E ROSS FAULKNER	ALFRED T OSCOOD
FREDERICK C HOLDEN	ARTHUR KRIDA, <i>Secretary</i>
HOMER F SWIFT	HOWARD LILIENTHAL
HARRY M IMBODEN	ABRAHAM L GARDAT
JOHN H DUNNINGTON	GEORGE MILLER MACKFEE

\* Executive Committee

# OFFICERS OF SECTIONS AND AFFILIATED SOCIETIES, 1936

## JANUARY TO MAY

### DERMATOLOGY AND SYPHILOLOGY

MAX SCHEER *Chairman*  
FRANK C COMBES, JR., *Secretary*

### SURGERY

CONDUCT W CUTLER, JR. *Chairman*  
WILLIAM F MACFEE, *Secretary*

### NEUROLOGY AND PSYCHIATRY

LEON H CORNWALL *Chairman*  
ABRAHAM A BRILL *Secretary*

### HISTORICAL AND CULTURAL MEDICINE

JEROME P WEBSTER, *Chairman*  
REGINALD BURBANK *Secretary*

### PEDIATRICS

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ALEXANDER T MARTIN *Secretary*

### OBSTETRICS AND GYNECOLOGY

WALTER B MOUNT, *Chairman*  
ARTHUR M REICH, *Secretary*

### OPHTHALMOLOGY

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LEGRAND H HARDY, *Secretary*

### MEDICINE

PAUL REZNIKOFF *Chairman*  
CLARENCE E DE LA CHAPELLE *Secretary*

### GENITO URINARY SURGERY

JOSEPH A HYAMS *Chairman*  
ROY B HENLINE, *Secretary*

### OTOLARYNGOLOGY

WESTLEY M HUNT, *Chairman*  
CHARLES W DEPPING, *Secretary*

### ORTHOPEDIC SURGERY

WALKER E SWIFT *Chairman*  
NICHOLAS S RANSOHOFF *Secretary*

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RAMSEY SPILLMAN, *President*  
E F MERRILL *Secretary*

### HARVEY SOCIETY

R KEITH CANNAN, *President*  
RANDOLPH WEST, *Secretary*

### SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE

E L OPIE *President*  
A J GOLDFORB, *Secretary*

### NEW YORK PATHOLOGICAL SOCIETY

WILLIAM C VON GLAHN *President*  
IRVING GRAEF, *Secretary*

## MAY TO DECEMBER

### DERMATOLOGY AND SYPHILOLOGY

J GARDNER HOPKINS, *Chairman*  
DAVID BLOOM, *Secretary*

### SURGERY

WILLIAM F MACFEE, *Chairman*  
RODERICK V GRACE, *Secretary*

### NEUROLOGY AND PSYCHIATRY

ABRAHAM A BRILL, *Chairman*  
IRVING H PARDEE, *Secretary*

### HISTORICAL AND CULTURAL MEDICINE

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REGINALD BURBANK, *Secretary*

### PEDIATRICS

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PHILIP M STIMSON *Secretary*

### OBSTETRICS AND GYNECOLOGY

ARTHUR M REICH, *Chairman*  
THOMAS E LAVELL, *Secretary*

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R W LEWIS, *Secretary*

### HARVEY SOCIETY

EUGENE L OPIE, *President*  
MCKEEN CATTELL, *Secretary*

### SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE

PHILIP E SMITH *President*  
A J GOLDFORB *Secretary*

### NEW YORK PATHOLOGICAL SOCIETY

CHANDLER FOOT *President*  
MILTON HELPERN *Secretary*



# MEMBERS OF ADVISORY COMMITTEES OF SECTIONS, 1936

## JANUARY TO MAY

### *Dermatology and Syphilology*

GEORGE M. MACKEE  
HOWARD FOX  
PAUL E. BECHET  
FRED WISE  
JOHN FRANK FRASER

### *Pediatrics*

HUGH CHAPLIN  
HERBERT B. WILCOX  
JOHN CAFFEY  
MARTHA WOLLSTEIN  
HARRY BAKWIN

### *Otolaryngology*

FRANCIS WHITE  
THOMAS J. HARRIS  
DAVID H. JONES  
SAMUEL J. KOPETZKY  
MARVIN F. JONES

### *Surgery*

OTTO C. PICKHARDT  
ROBERT H. KENNEDY  
WM. BARCLAY PARSONS  
RALPH COLP  
GUILFORD S. DUDLEY

### *Ophthalmology*

ERNEST T. KRUG  
\*\*HERBERT W. WOOTTON  
CLYDE E. McDANNALD  
(Elected March 16  
1936, to fill unexpired  
term of Dr. Wootton)  
MARK J. SCHOENBERG  
BERNARD SAMUELS  
WEBB W. WEEKS

### *Orthopedic Surgery*

ALAN DEFOREST SMITH  
ISADORE ZADEK  
MATHER CLEVELAND  
PAUL C. COLONNA  
LEO MAYER

### *Neurology and Psychiatry*

IRVING H. PARDEE  
JOSEPH H. GLOBUS  
BYRON STOOKEY  
CLARENCE P. OBERNDORF  
\*C. BURNS CRAIG

### *Obstetrics and Gynecology*

HERVEY C. WILLIAMSON  
GERARD L. MOENCH  
SAMUEL J. SCADRON  
DAVID N. BARROWS  
HARVEY B. MATTHEWS

### *Historical and Cultural Medicine*

FREDERICK PETERSON  
LOUIS F. BISHOP  
HOWARD R. CRAIG  
EUGENE F. DUBOIS  
RUSSELL L. CECIL

### *Medicine*

LEWIS FOX FRISSELL  
MILLS STURTEVANT  
WILLIAM S. LADD  
PETER IRVING  
ROBERT F. LOEB

### *Genito Urinary*

ARCHIE L. DEAN, JR.  
THOMAS J. KIRWIN  
MEREDITH F. CAMPBELL  
GEORGE F. HOCH  
C. TRAVERS STEPITA

## MAY TO DECEMBER

### *Dermatology and Syphilology*

HOWARD FOX  
PAUL E. BECHET  
FRED WISE  
JOHN FRANK FRASER  
RAY H. RULISON

### *Pediatrics*

HERBERT B. WILCOX  
JOHN CAFFEY  
MARTHA WOLLSTEIN  
HARRY BAKWIN  
BELA SCHICK

### *Otolaryngology*

THOMAS J. HARRIS  
DAVID H. JONES  
SAMUEL J. KOPETZKY  
MARVIN F. JONES  
WESTLEY M. HUNT

### *Surgery*

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WM. BARCLAY PARSONS  
RALPH COLP  
GUILFORD S. DUDLEY  
CONDUCT W. CUTLER, JR.

### *Ophthalmology*

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MARK J. SCHOENBERG  
BERNARD SAMUELS  
WEBB W. WEEKS  
LEWIS W. CRIGLER

### *Orthopedic Surgery*

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MATHER CLEVELAND  
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LEO MAYER  
WALKER E. SWIFT

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JAMES H. HUDDLESON  
LEON H. CORNWALL

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ROBERT F. LOEB  
ALBERT R. LAMB

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SAMUEL J. SCADRON  
DAVID N. BARROWS  
HARVEY B. MATTHEWS  
FRANCIS W. SOVAK

### *Historical and Cultural Medicine*

LOUIS F. BISHOP  
HOWARD R. CRAIG  
EUGENE F. DUBOIS  
RUSSELL L. CECIL  
ALLEN O. WHIPPLE

### *Genito Urinary*

THOMAS J. KIRWIN  
MEREDITH F. CAMPBELL  
GEORGE F. HOCH  
C. TRAVERS STEPITA  
AUGUSTUS HARRIS

\* Deceased  
\*\* Resigned

# COMMITTEES APPOINTED ANNUALLY

1936

## APPOINTED BY THE PRESIDENT NOMINATING COMMITTEE

BERNARD S OPPENHEIMER, *Chairman*

MALCOLM GOODRIDGE

MORRIS K SMITH

## TRUSTEE COMMITTEES

### EXECUTIVE COMMITTEE

JAMES ALEXANDER MILLER, *Chairman*

EUGENE H POOL

LEWIS F FRISSELL

### BUDGET COMMITTEE

JAMES ALEXANDER MILLER, *Chairman* EUGENE H POOL

WILLIAM S LADD

BERNARD SACHS

## COUNCIL COMMITTEES

### MEDICAL INFORMATION BUREAU

#### *Academy Representatives*

JOHN J MOORHEAD, *Chairman*

JOHN DOUGLAS

ALEXANDER T MARTIN

R N PIERSON

HENRY ALSOP RILEY

CHARLES D RYAN

FRED P SOLLEY

ORRIN S WIGHTMAN

WILLIAM C WHITE

ARMITAGE WHITMAN

#### *County Representatives*

LEWIS BEEBEAN

H G BULLWINKLE

THOMAS J HARRIS

PETER IRVING

SAMUEL J KOETZKA

I KROSS

HAROLD R MINSELL

M R ROBINSON

HERMAN SHARLIT

ARTHUR STEIN

IAGO GALSTON, *Executive Secretary*

### COMMITTEE ON REVISION OF BY-LAWS

R H PATTERSON, *Chairman*

HENRY C FALK

RODERICK V GRACE

ROBERT H KENNEDY

CHARLES A MCKENDREE

### COMMITTEE ON HONORARY FELLOWSHIP AND MEDAL

BERNARD SACHS, *Chairman*

EDWIN BEER

HOWARD CRAIG

EUGENE F DUBOIS

HERMANN GOLDENBERG

FOSTER KENNEDY

EMANUEL LIBMAN

SAMUEL MCCULLAGH

BERNARD S OPPENHEIMER

WALTER W PALMER

LOUISE PEARCE

SIGMUND POLLITZER

CHARLES STOCKARD

GEORGE B WALLACE

BENJAMIN P WATSON

JOHN M WHEELER

ALLEN O WHIPPLE

FRANCIS CARTER WOOD

ARCHIBALD MALLOCH, *Secretary*

Recent reports of the Council and the Board of Trustees have repeatedly called attention to the fact that the financial resources of the Academy have barely been sufficient to meet the necessary expenses. For several years the budget, as adopted by the Trustees on the recommendation of the Council, has shown a substantial deficit at the beginning of the year. Through the efforts of the officers of the Academy, these deficits have been met by very generous and substantial contributions from a handful of friends of the Academy to whom the Council desires at this time to express its especial appreciation.\* The difficulties, of course, were aggravated during the years of the depression, when the Academy's earnings on its fixed capital were very materially reduced, but we are now able to report that because of the increased earning power of invested capital and an increase in endowment, our annual income is again approaching its maximum. During the years of depression, however, the growth of the Academy which began when we took possession of our new building in 1926 was not lessened and the governing bodies have felt that added demands of this growth should not be neglected. As a result of these factors the budget as adopted for the year 1937 is out of balance by approximately \$30,000. While economies and sources of income now uncertain may reduce this by a considerable amount, it is nevertheless obvious that such a situation is highly unsatisfactory and one that calls for correction. The Council and the Trustees during the current year have reviewed our position very carefully with the result that these two bodies have authorized the organization of a fund-raising campaign and the necessary committees for this purpose were duly appointed and began operation during 1936. As a first step, a very careful analysis of all activities of the Academy was made by special committees appointed for the purpose. Reports of these committees show conclusively that there is a constantly increasing demand upon the Academy for service both to its membership and to

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\* See Report of Board of Trustees, Gifts and Bequests, page 169

the community. The addresses given by the retiring and incoming Presidents at the annual meeting (See March 1937 Bulletin) show this in an interesting and challenging way. Emphasis is placed on the amount of service rendered to the general public, which has no clear idea of the nature, and no idea at all of the extent of this service. At the present time, \$35,000 additional annual income is required to meet the cost of those Academy activities for which the Council feels provision should be made. Giving due consideration to the growth that continues uninterruptedly, this amount must be increased to \$50,000 annually if the work of the Academy is to be maintained upon a high plane of efficiency.

The unpredictable growth of the Library has brought about a critical condition much earlier than could have been foreseen at the time that the Academy took possession of its new building. In 1939, the Library stacks will be filled to their maximum working capacity. To erect the additional stacks, provision for which was made in the construction of the present building, will cost, according to present estimates, approximately \$300,000 which sum may be insufficient if action be delayed and the anticipated increase in the cost of building materializes.

The Council, taking all these factors into consideration, is attacking the problem by dividing it into three parts. An attempt will be made to get the membership and the general public interested in the needs of the Academy, so that over a period of years the additional income will be available. Special efforts will be made to find the necessary money to provide for the additional book space in the library. A long period campaign for the purpose of gradually building up additional endowment totalling two million dollars is to be undertaken. Success in these will place the Academy on a satisfactory financial basis with ability to meet its present and anticipated responsibilities. The program by which these ends are to be reached will shortly be presented to each of our Fellows and Members. It is the earnest hope of the Council and the Trustees that

the consideration which the seriousness of the situation justifies will be accorded to it

In addition to this major occupation of your governing bodies, there came before the Council for consideration a large number of administrative problems

*Executive Secretary to the Committee on  
Medical Education*

The Council reports with regret the retirement of Dr Frederick P Reynolds from the positions of Medical Secretary of the Committee on Medical Education and Assistant Secretary to the Academy after a period of twelve years service. The Council took occasion to spread upon its minutes a resolution expressing its deep appreciation of the service rendered by Dr Reynolds, as follows

"Dr Frederick P Reynolds has served The New York Academy of Medicine continuously from April 1924 through December 1936 as Secretary of the Committee on Medical Education and as Assistant Secretary of the Academy. During the ten year period 1926-35 when the Bulletin of the Academy was under the direction of the Committee on Medical Education, Dr Reynolds assumed many of the responsibilities of Editor of the Bulletin. In the performance of these diverse duties, Dr Reynolds has unfailingly rendered service of an outstanding character. His enthusiasm has been a constant inspiration to all the members of the Committee which he has served. No suggestion for an increased influence of the Academy in the educational field has ever failed to elicit Dr Reynolds' enthusiastic support. His accomplishment in these twelve years of loyal and faithful service is reflected in the extraordinary growth and development of the Academy during this period especially in the vastly increased service to the medical profession and to this community in the field of continued instruction to the graduate physician."

The Academy is to be congratulated in securing as Dr Reynolds' successor Dr Mahlon Ashford, United States Army Medical Service, retired. Dr Ashford's training has, in many respects, been similar to that of Dr Reynolds,

and has included a very considerable experience in the problems of medical education

### *Joseph Collins Lectureship*

It is with satisfaction that the Council announces the inauguration of the Joseph Collins Lectures, made possible through the generosity of one of our Fellows, Dr Joseph Collins, who brought the subject to the attention of the Council through our former President, Dr Bernard Sachs. Dr Collins placed at the disposal of the Academy a sum sufficient to procure a lecturer of outstanding merit to deliver a series of lectures at the Academy during the year 1937 on some subject identified with neurology and psychiatry. A special committee was appointed to confer with Dr Collins in procuring a lecturer and determining the subject matter to be presented. As the result of several meetings of this committee of which Dr Sachs was Chairman, Dr Charles R Stockard, Professor of Anatomy at Cornell University Medical College, was chosen as the first lecturer, the subject being "The Interaction Between Internal Secretions and the Nervous System". The agreement arrived at provides only for two lectures to be given in 1937, but as specified by Dr Collins when making the grant, these lectures with a complete record of the underlying studies will be published in a special volume immediately after their presentation at the Academy. There is reason to believe that if the undertaking proves to be mutually satisfactory provision will be made for the lectures as a permanency. If a permanent fund be set up, the use of the income may be less restricted and applied to some other purpose at the discretion of the Council within the terms of the gift.

### *Academy Bulletin*

The policy governing the publication of an Academy Bulletin has been given serious consideration by the Council, the Committee on Medical Education, and special committees appointed for the purpose over a period of years. The result indicates that there is more than a

little dissatisfaction with the Academy Bulletin as heretofore conducted. Sporadic attempts have been made to place the Bulletin on a desirable level among medical publications but these have died without result largely because of the lack of available funds. During the year, the matter again received intensive study and the opinion was general that The New York Academy of Medicine should be represented by a publication much more impressive and dignified than that which has hitherto appeared.

To effect the desired end a specially chosen Editorial Board was appointed by the Council to report directly to the Council, instead of the Committee on Medical Education. Rather than attempt a complete change of the Bulletin, both in format and content, the Editorial Board has accepted a policy of slow growth toward the desired objective of placing the Bulletin in a position of major importance in the field of medical journals. An arrangement has been made with the Harvey Society whereby the papers presented at its meetings may appear in the Bulletin. Papers read before the Sections are to be considered for publication either in full or in abstract. A general policy was adopted concerning advertisements to appear in the Bulletin. This policy prescribes that no article of therapeutic use shall be advertised in the Bulletin unless it has been accepted by the Council on Pharmacy and Chemistry or the Council on Physical Therapy of the American Medical Association. While this restriction very seriously affects the income from advertising, there is no escape from it if the Academy is successfully to carry forward its campaign of opposition to misleading and undesirable advertising in the general field of medicine.

Dr. Ashford, Executive Secretary of the Committee on Medical Education, has kindly consented to act as the Editor of the Bulletin in addition to his other responsibilities. It is recognized that if our hopes are realized, this can only be a temporary arrangement and that ultimately provision will have to be made for an editorial staff to

carry at least a part of this burden. The Editor serves under the Editorial Board, the present personnel of which is Dr Jerome P Webster, Chairman, Drs Alfred E Cohn, Eugene F DuBois, Robert F Loeb, H B Logie, Archibald Malloch, Karl Vogel and Mahlon Ashford, Secretary

### *Medical Society of the County of New York*

The fact that the Medical Society of the County of New York has maintained its offices in the Academy building has made it possible for the Academy and this Society to cooperate in a way that otherwise would have been impossible. The officers of both of these organizations have long felt the need of a complete understanding between them as many of the problems to be met are of common interest. Heretofore, there had existed no formal agreement by which such a policy of cooperation was easily executed. The Council recognized this situation and after negotiation an agreement was reached whereby before any action affecting the general medical profession was taken by the Academy, a consultation might be arranged either with the President of one of the five County Medical Societies of the city or, if the matter affects the entire city, with the Coordinating Council of the five County Societies. This arrangement has proved more than helpful and has already demonstrated its value in connection with revision of the city charter, the establishing of health centers by the Department of Health and in presenting a united front toward various projected policies of governmental bodies. It was also particularly useful in the creation of a Medical Advisory Committee to the Emergency Relief Bureau of the City and to the Works Progress Administration, the function of which was to give advice to the medical and nursing service. The combined influence of the Academy and the County Societies was sufficient to bring into operation a type of medical and nursing service which has proved not only effective for the sick on the relief rolls but very satisfactory to the physicians who have done the actual work.



*Other Associated Activities*

From time to time the Council, on the recommendation of some one of its departmental committees, authorizes the procuring of funds for special studies to be carried on either directly under the supervision of the Academy or independently by special bodies organized for the purpose. Of these a number reported on below have been especially active during the year under review.

*Committee on Medical Jurisprudence*

Judge Benjamin Cardozo delivered the Anniversary Discourse in 1928 on the subject "What Medicine Can Do For Law". This address so definitely pointed out serious defects in medical jurisprudence that The New York Academy of Medicine in conjunction with the Bar Association of New York, appointed a joint Committee on Medical Jurisprudence. That Committee has been actively at work ever since, though the greater part of the burden has fallen upon the Academy members of the Committee, and the completion of our aims was almost entirely due to their efforts. Reports of their endeavors and accomplishments have appeared from time to time in our annual reports, but it is only within the year that the full benefit of their work can be appreciated. In 1933, under the title "To amend the Code of Criminal Procedure in relation to the employment of experts in a criminal case when the defendant is not financially able to employ an expert" and under the title "To amend the Code of Criminal Procedure in relation to the proceedings when a person in confinement appears to be insane or a mental defective", there were enacted amendments to Sections 308 and 836 respectively. There was included in the latter amendment a specific clause relating to "qualified psychiatrists", though this term had not as yet been defined legally. The possibilities inherent in this inclusion led to intensive work on the part of the Committee and in 1936 two bills which will have an important bearing upon the administration of criminal law in New York State passed the Legislature and received the signature of the Governor. Section 658

of the Code of Criminal Procedure was amended "In Relation to the inquiry into the mental condition of a defendant before or during trial, or before sentence" An amendment to Section 27 of the Mental Hygiene Law providing for the certification of qualified psychiatrists was also passed The New York Sun on May 6, 1936 commented upon this accomplishment in the following way

"Governor Lehman approved today two bills of Assemblyman James R Robinson, Republican, of Tompkins, remedying evils in the system of appointing lunacy commissions

"These two measures," said the Governor, "seek to remedy evils which have existed for a long time in connection with the appointment of lunacy commissions by the courts for the examination of defendants charged with crime, whose sanity is put in question

"The first of these two bills establishes a board of psychiatric examiners to grant certificates to qualified psychiatrists The other bill gives to the court, on its own motion or motion by either the people or the defendant, the power to appoint a lunacy commission at any time before final judgment At least one member of such a commission must be a qualified psychiatrist as defined in the first of these two bills Hereafter a person under indictment who may be suffering from a mental disorder will have the benefit of the knowledge and experience of a specialist The bill also fixes a maximum compensation for each of the members of the commission and thereby puts an end to the payment of any excessively high fees

"The enactment into law of these two bills is a successful culmination of years of great effort on the part of many persons such as Dr Israel Strauss, Chairman of The Committee on Medical Jurisprudence of the New York Academy of Medicine, and Mr E R Cass, Secretary of the Prison Association of New York and member of the State Correction Commission The bills have been strongly supported by the State

Medical Society, the New York Academy of Medicine, the State Charities Aid Association, the Prison Association of New York, the Brooklyn Bureau of Charities and the New York County Lawyers' Association"

As pointed out by the New York Sun, these very desirable results were only brought about by the insistent and devoted work of Dr Israel Strauss, Chairman of the Committee on Medical Jurisprudence of The New York Academy of Medicine, and Mr E R Cass, Secretary of the Prison Association of New York and a member of the State Correction Commission. These men showed a persistence of effort against a difficult opposition which the Council takes pleasure in commending.

With the permission of the Carnegie Corporation, which contributed the necessary funds to finance the Committee on Medical Jurisprudence throughout its existence, a sufficient sum was allocated from the funds in hand to make a thorough investigation of sterilization laws throughout the country. This work was carried out under the Chairmanship of Dr Abraham Myerson of Boston with a committee named by the American Neurological Association. The Carnegie Corporation further permitted the necessary allocation of funds to provide for the publication of this report by the Macmillan Company under the title "Eugenical Sterilization" and this book is now on the market.

### *Nomenclature*

The National Conference on Nomenclature, organized on the recommendation of the Committee on Public Health Relations is completing its seventh year of work. The "Standard Classified Nomenclature of Disease" is now in use by approximately 300 hospitals including 40 hospitals associated with university medical schools. Slowly, but surely, it is taking its place as the official nomenclature of the United States. The significance of this cannot be overstated. This Conference under the Presidency of Dr Haven Emerson with Dr George Baehr as Chairman of the Executive Committee and Dr H B Logie as Executive

Secretary is entitled to unstinted praise and commendation for the work accomplished. The Commonwealth Fund through continued support has supplied the major part of very considerable sums of money necessary for this accomplishment. The Carnegie Corporation, the Metropolitan Life Insurance Co. and the Rockefeller Foundation have also aided in the undertaking. Efforts are now being made to transfer the work of the Conference to one of the national clinical organizations because if the full fruition of a national nomenclature is to be attained, it must be fostered by the clinicians who will use it in their hospital and private practice. It is not easy to overstate the great good that will result in medical thought, medical teaching and medical practice from the national adoption of a standard nomenclature based upon such philosophical considerations as is this volume.

### *Study of Internships*

The Council, upon the recommendation of the Committee on Medical Education approved of the obtaining of funds for the purpose of an intensive study of the educational value of residencies and internships in the metropolitan hospitals. Again, the Commonwealth Fund came to our assistance and contributed the necessary amount to make this study effective. The New York Committee on the Study of Hospital Internships and Residencies was established in 1934 by representatives of the university medical schools and the Academy with Dr. John Wyckoff as Chairman and Dr. J. A. Curran as its Executive Secretary. The study is approaching its completion and within the year the final report will appear in book form. While the Academy has only been partly responsible for the actual accomplishment of this very desirable result, it was upon its initiative that the work was begun and the Council points out with satisfaction this additional example of the leadership which the Academy endeavors to maintain.

### *Forensic Medicine*

It is too early yet to report upon the attempt to establish an Institute of Forensic Medicine in New York City.

which was recommended by the Committee on Public Health Relations for the consideration of the Council. The undertaking is still in the formative stage. While we have been disappointed in getting the hoped for financial support in full, there is still evidence that the very active group of medical college and Academy representatives which has devoted much time and effort will advance the interests of forensic medicine to a very considerable extent during the coming year.

### *Academy Medal*

Upon the recommendation of the Committee on Academy Medal, the medal was awarded to Dr Alfred Newton Richards, Professor of Pharmacology, University of Pennsylvania, and was presented to him on the occasion of the delivery of the Anniversary Discourse.

### *Honorary Fellows*

The Committee on Honorary Fellowship recommended for election as Honorary Fellows six candidates whose names with their titles appear in the membership roster at the end of the Annual Report.

### *Ceremonial at Stated Meetings*

It is recalled that in 1934, the custom of having the officers appear at the Stated Meetings in academic gowns was inaugurated. The reaction to this was so favorable that the Council determined to go one step further in adding to the dignity of the meetings by having all candidates for diplomas also appear in caps and gowns. This has given to the Stated Meetings in January and May, when the diplomas are presented, a university atmosphere which also meets with general approval.

It was believed by the Council that the collation following the Stated Meetings which had been provided for by the Loomis Entertainment Fund really served no useful purpose and it was therefore voted to discontinue it. The income of this fund is now used, as determined by the Council, toward the entertainment of distinguished guests on the occasion of their appearance before the Academy.

In submitting this report, the Council records its great appreciation of the work that has been accomplished by the Standing and other Committees during the year. These activities are fully set forth in the departmental reports and speak for themselves. The Council, however, cannot refrain from emphasizing the fact that the service rendered to the Academy by those who are so active in this work is the mainstay of Academy influence and accomplishment. It is no small matter to ask of the Fellows and Members of the Academy that they should year after year devote hours of hard work toward the carrying out of the Academy program. Without exception those who have been asked to do this have accepted the invitation with enthusiasm and a sense of responsibility which cannot be too highly commended. In this respect, The New York Academy of Medicine is probably a unique institution, and exemplifies to the highest degree the traditional willingness of the medical profession to render disinterested service.

The Council also records with great satisfaction its recognition of the fact that the service of the Fellows and Members can only be made effective because of the devoted effort of our entire staff. The Council desires to record its full appreciation of the service thus rendered.

EUGENE H. POOL, *President*

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## REPORT OF THE BOARD OF TRUSTEES

### TO THE COUNCIL, FELLOWS AND MEMBERS

It is with satisfaction that the Board of Trustees reports that during the year 1936 they were able, through the special efforts of Dr. Samuel W. Lambert, Dr. George Baehr and the Director, to secure special contributions to fully eliminate the Budget deficit of \$20,919.53, which was accepted at the beginning of the year as necessary to properly conduct the Academy affairs. In fact, in addition to this sum \$8,000 was available for the very much needed

repairs to the building and furniture While we have not yet reached full recovery from the much reduced income as a result of the general depression, this goal has nearly been attained It has been brought about by taking full advantage of the general uptrend and by very close attention to the details of investment both in liquid securities and bonds and mortgages The former have been serviced as heretofore by the Fiduciary Trust Company and, while in most instances the Trustees have accepted the recommendation of this company in making transfers or new purchases of securities, this has only been done after careful scrutiny by the Trustees and the Executive Committee In some instances the Trustees have not felt justified in taking what might be considered a speculative point of view in attaining a temporary advantage The Trustees are not limited by the usual statute requirements in the handling of trust funds but nevertheless have adopted a conservative policy in this respect Only after a very careful study of the problem have they authorized investments in other than trust fund securities and then to the definitely limited amount that has been recognized by authorities as justified by the changed conditions in the bond and preferred stock group as compared to the equities in common stock The Academy has continued to manage our mortgages by its own staff with a very satisfactory degree of success During 1936 our invested funds in securities yielded a return of 3.8 per cent, while our mortgages produced an income upon their book value equal to 5.2 per cent This result was achieved notwithstanding the fact that we have to date been required to take over for ownership six properties having a total valuation of approximately \$91,000 on which we had guaranteed mortgages in the past upon the recommendation of the then highly valued advice of the guarantee mortgage companies An analysis of the mortgage situation at the present time indicates that in the end our total loss in principal from these investments will be a very insignificant one and that our return in income will not have been materially lessened

While these facts are a cause for congratulation and indicate that the fiscal policy of the Academy has been a sound one, it does not change the situation insofar as the need for additional income is concerned. The Trustees, guided by a policy of broadmindedness have for several years without exception faced at the beginning of each fiscal year a very considerable deficit, the estimated operating expenses greatly exceeding anticipated income. This has been done because, on the advice of the Council, the Trustees have been unwilling to lessen the efficient standard of work that the Academy has maintained during its entire existence.

Whenever natural growth has demanded a corresponding increase in resources, the Academy, guided by the Council and Trustees, has courageously faced the situation and necessary monies have been provided.

At the end of 1936 the estimates of the various departments for needed expenditure during the year 1937 again show that the total exceeds anticipated income by approximately \$30,000. The reason for this is that the increasing demand on the Academy is little less than astounding, if it is to meet the responsibilities and obligations with which it is faced. While the Trustees have long recognized the undesirability of authorizing expenditures in excess of anticipated income, they equally recognize the undesirability of shutting off the service that the Academy is rendering to its membership and the public. Mature judgment emphasizes that a situation such as this can only be tolerated as something of an emergency. To end this emergency, as has been set forth in the report of the Council, a fund raising campaign has been authorized by both the Council and the Trustees, which appears in some detail in that report, and, as therein stated, will be presented in detail to the membership and the public at an early date.

It is the hope of the governing bodies of the Academy that the public at large can be made to understand the great service that the Academy is rendering to the community and with this knowledge, will consider it an obliga-



tion to support The New York Academy of Medicine in the same generous way in which it supports other institutions which, though of a private nature, are rendering public service

A reorganization of the operating staff of the building took place during the year. This staff was placed under Mr. Joseph Finnan, a former employee, as Superintendent. This has proved to be very beneficial and there is a notable improvement in the appearance of the building and the furnishings as well as in the service rendered to those who are working in the building.

The Trustees desire to record herein their true appreciation of the splendid cooperation of all members of the staff in practising economy and in rendering full service under circumstances which are not infrequently very trying and difficult. There are times when the Academy is literally a bee-hive of activity. To keep this activity running in smooth channels is no easy task. It is only accomplished because of the loyalty and excellent morale of those who work unselfishly for the Academy.

The 1937 Budget and the details of additions to our resources are appended, while the report of the Treasurer shows full details of the Academy's financial position as of December 31, 1936.

The Trustees take this opportunity to express their deep appreciation for the gifts and bequests to the Academy which are set forth hereafter.

JAMES ALEXANDER MILLER, *Chairman*

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### BUDGET 1937

#### *Budgetary Income*

Investments	\$131,600 00
Dues—Members	71,500 00
Room Assessments	16,200 00
Contributions	10,000 00
Bank Interest	250 00
<b>TOTAL</b>	<b>*\$229,550 00</b>

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*Budgetary Expenditures*

Administration Salaries	\$ 31,949 90
"    Operative Costs	30,250 00
"    Restricted Funds	8,085 00
Building Operation Salaries	30,134 70
"    Operative Costs	15,700 00
Library Salaries	63,003 60
"    Operative Costs—Net	* 25,650 00
Public Health Salaries	16,671 81
"    "    Operative Costs	600 00
Medical Education Salaries	14,872 20
"    "    Operative Costs—Net	* 12,305 00
Medical Information Salaries	8,694 80
"    "    Operative Costs—Net	* 900 00
 TOTAL	 \$258,817 01

\* \$21,000 Income used to reduce Gross Operative Costs

## ALLOCATION OF FELLOWS' DUES — 1937

1 Building Operation	\$45,834 70
2 Library	15,665 30
3 Stated Meetings and Membership Bureau	8,000 00
4 Subscriptions to Bulletin	2,000 00
 TOTAL	 \$71,500 00

The following gifts and bequests have been received during the year

## GIFTS AND BEQUESTS

*For Endowment*

<i>Purpose</i>	<i>Donor</i>	<i>Amount</i>
Medical Information Bureau	Milbank Memorial Fund	\$50,000 00
Library	Anonymous	50,000 00
Traveling Expenses	Mrs Jesse Isidor Straus	5,000 00
 TOTAL NEW ENDOWMENT		 \$105,000 00

*For Current Use*

<i>Purpose</i>	<i>Donor</i>	<i>Amount</i>
Academy General Purposes	Anonymous	\$10,000 00
Academy Deficit 1936	"	10,000 00
"    "    "	"	2,500 00

Academy Deficit 1936	Anonymous	2,000 00
" " "	"	300 00
" " "	Mrs Otto Hensel	100 00
" " "	Dr Samuel W Lambert	40 00
Library Staff	Mr & Mrs Carll Tucker	2,170 00
(Also pledged for 1938 and 1939)		
Collins Lectureship	Dr Joseph Collins	6,000 00
Foreign Scholarships	Mrs Alexander Cochran Bowen	4,000 00
Preventive Medicine Publication	Milbank Fund	1,750 00
Sterility Study	Carnegie Corporation	1,273 47
Employees Christmas Fund	Fellows and Members (pledged \$184 00)	1,556 50
Building Fund	Fellows and Members	1,105 00
Books on Dentistry	First District Dental Society	500 00
Graduate Fortnight 1936	Macy Foundation	500 00
Library Publications Fund	Dr Logan H Clendenen	100 00
" " "	Anonymous	100 00
Rare Books	Mrs Walter G Ladd	100 00
" "	Mrs Samuel W Lambert	50 00
" "	Dr Eleanor B Kilham	50 00
" "	Dr M Claudius Warsaw	50 00
" "	Anonymous	50 00
TOTAL		<hr/> \$44,294 97 <hr/>

JAMES ALEXANDER MILLER, *Chairman*

#### ABSTRACT OF TREASURER'S REPORT

I have the honor to present The New York Academy of Medicine Statement of Assets and Liabilities as at December 31, 1936, as follows

#### *Assets*

Cash in Bank and on hand	\$ 79,140 37
Investments	
*Mortgages	\$1,076,825 00
*Stocks (Market \$1,109,966)	847,915 51
*Bonds (Market \$833,840)	816,324 24
Real Estate	213,260 26
	<hr/> 2,954,325 01
Accounts Receivable (Fiduciary Trust Co)	57,185 47

\* List may be reviewed, by members, upon application to the Director or the Treasurer's office

Fixed Assets		
Academy Land and Building	\$2,217,448 91	
Library and Furniture	960,234 61	3,177,683 52
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Deferred Assets and Expenditures		
Estate of Dr A C Powers	\$ 1,513 98	
Unexpired Insurance	3,778 57	
Deposits and Foreclosure Costs	7,984 90	13,277 45
<hr/>		
TOTAL ASSETS		\$6,281,611 82
<hr/>		

### Liabilities

General Property Fund Balance Jan 1, 1936		
(including Celine B Hosack's bequest \$70,000)	\$3,147,959 06	
Add Library Additions for 1936	28,045 65	
Equipment	1,678 81	\$3,177,683 52
<hr/>		
Endowment Fund Balance Jan 1, 1936	\$ 942,220 10	
Add Milbank Memorial Fund	50,000 00	
Admission Fees	3,300 00	
Miscellaneous	50 12	
<hr/>		
	\$ 995,570 22	
Loss through Sale of Securities	5,399 09	990,171 13
<hr/>		
Educational Endowment Fund (Rockefeller Foundation)		1,250,000 00

### LIBRARY FUNDS

#### *For the General Purposes of the Library*

The Library Fund, Balance		
Jan 1, 1936	\$301,945 55	
Add Receipts—Sale of Implicates	8 50	\$301,954 05
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Landon Carter Gray Fund Established 1911	\$ 46,596 05	
Allocated by Trustees	3,403 95	50,000 00
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Nemo Library Fund through Samuel W Lambert, MD Established 1936	50,000 00	
Everett Herrick Fund Established 1915	25,000 00	
Anna Woerishoffer Fund Established 1897	15,000 00	
Stafford McLean Fund Established 1933	15,000 00	

William S Halsted Fund Established 1930	10,000 00
William C Jarvis Memorial Fund—Nathan S Jarvis Legacy 1935	3,000 00
Accounts Payable (1936)	18,051 00
Employees Annuity Reserve	6,869 29
Deferred Income (1937 Dues)	2,864 00
Reserve for library additions	10,027 69
Trust Funds	27,686 70
<b>TOTAL LIABILITIES</b>	<b>\$6,281,611 82</b>

*Statement of Income and Expense*

<i>Income</i>	
Investments	\$ 126,353 89
Membership Dues	71,031 50
Contributions	27,590 00
Room Assessments	17,781 25
Bank Interest and Miscellaneous	1,233 45
	<hr/>
	\$ 243,995 09
<i>Expense</i>	
Administration and General	\$49,271 59
Building Operation	55,132 59
Library	89,505 47
Medical Education and Bulletins	25,248 13
Public Health	13,121 65
Medical Information and Preventive Medicine	10,173 28
	<hr/>
Balance Reserved for Depreciation of Furnishings and Equipment	\$ 1,242 38

BERNARD SACHS, *Treasurer**Auditor's Certificate*

(Page 13 of the report)

We have examined the books and accounts of The New York Academy of Medicine for the year ended December 31, 1936, and hereby certify that the Balance Sheet and Statement of Income and Expense herewith submitted, in our opinion, correctly reflect the financial condition as at December 31, 1936 and the results of operations for the year then ended, the accounts being kept on a cash basis

Respectfully submitted

MILLER, DONALDSON AND COMPANY

## REPORT OF THE COMMITTEE ON ADMISSION

The Committee on Admission reports to the Academy that during the past year sixty-four applications for membership were considered. Of these, fifty-two were recommended for Resident Membership, four for Nonresident Membership and two for Associate, six applicants were dropped.

The Committee met each month except during the summer. On December 31, 1936, there were forty-eight vacancies. There are fifty-six applicants for Membership, now before the Committee.

The Committee seeks the cooperation of the Fellows and Members in asking that they give support to candidates believed to be desirable and write as fully as possible in regard to them. The Committee also asks that the Members and Fellows exercise the greatest care in considering whether or not they desire to support a candidate. It has happened on a number of occasions during the past that one or more of the sponsors of an applicant have withdrawn their approval of the candidate, either verbally or in writing which is always embarrassing to the Committee.

HARRY BAKWIN *Chairman*

## REPORT OF THE COMMITTEE ON FELLOWSHIP

The Committee on Fellowship met only twice during 1936 as there were not many applications for consideration.

The applicants considered and approved for promotion from Membership to Fellowship are as follows:

- Dr. Edgar M. Bick—Orthopedic Surgery
- Dr. Anthony C. Cipollaro—Dermatology and Syphilology
- Dr. Thomas Francis Duhigg—Medicine
- Dr. B. A. Goodman—Surgery
- Dr. Russell Clark Grove—Otolaryngology
- Dr. William Needles—Neurology and Psychiatry
- Dr. Gordon D. Oppenheimer—Surgery

HERBERT B. WILCOX, *Chairman*

## REPORT OF THE COMMITTEE ON LIBRARY

The year 1936 is noteworthy as during it we have been forced to realize that the Library has grown so much in late years in the number of its readers and also in the extent of its possessions that we must provide for its future. The Library now has more than 218,000 volumes, not counting duplicates. The readers numbered 58,528, in contrast with 55,607 in 1935, and 26,093 in 1927. It was noticed one afternoon during the Christmas holidays that every one of the 107 seats in the Reading Room and the Periodicals Room was occupied whilst numerous other readers were busy at the catalogue tables and the delivery desk. The greatest number of readers for one day was 292. During the month of June, a classification was made of those who come to consult our magazines and books.

Physicians in N Y C (including 590 Fellows and Members of the Academy)	2,418
Physicians outside of N Y C (Australia, England, Africa)	175
Non-medical scientists	164
Law workers	63
Medical students	236
Non-medical students	137
Members of newspaper staffs	33
Secretaries	169
Miscellaneous	913
<i>Total</i>	<hr/> 1,308

From these figures one sees that sixty per cent were doctors of medicine and that thirteen per cent were Fellows or Members of the Academy. In the old building in 43rd Street the public was not admitted to the Library except between the hours of nine and one but when we moved to the new building in the autumn of 1926, this period was lengthened to five in the evening. The attendance is now so great that it is often impossible for the staff of the Reference and Reading Room Department to look after the readers in proper fashion between the hours of three and five. Each one of these men has duties of his own to perform in addition to taking care of readers.

## SUBCOMMITTEES ON THE NEEDS OF THE LIBRARY

In order to study the work now done in the Library, and to calculate its needs in the future, your Chairman was empowered to appoint two subcommittees. The members were chosen from the Fellowship of the Academy in general as well as from past and present Committees on Library. The first subcommittee was asked to study in a general and a detailed way the work of each department of the Library, from the choosing and ordering of books until they are listed as accessions and placed on the shelves. It had two meetings with Dr Samuel W Lambert as Chairman, at which the heads of departments described their work and answered questions. The second subcommittee, with Dr J Ramsay Hunt at its head, studied at two sessions the work of the various departments in connection with the books and magazines after accessioning and in connection with their care of the readers. Seventeen members in all were invited to act and this Committee takes this opportunity of expressing its gratitude for the eager interest they took in the work of the subcommittees. Dr Lambert and Dr Hunt both submitted reports which were combined into one during the summer by Miss Doe, Assistant Librarian, Dr Malloch, and myself. This Committee, acting as a whole, recommended that the "Report on the Library" be submitted to the Council and Trustees. It was briefly described and placed before them at their meeting in October. The summary of the Report, which it seems timely to quote is as follows:

The facts (1) that the number of readers has more than doubled in size in 10 years (22,350 in 1926 to 55,607 in 1935), (2) that the budget of the Library has decreased having as sequences, decrease in the purchase of books, decrease in the number of the Staff, and underpayment of certain members of the Staff, and (3) that the provision for housing the collections of books and periodicals will soon be exhausted, have compelled the Library Committee to prepare a detailed report for the consideration of the Council and Trustees.

The Library has become great and important. It is second only to the Army Medical Library in this country and abroad to the



Library of the Faculty of Medicine in Paris. It is the only medical library open to the public in New York. It is not run as formerly, exclusively for the Members and Fellows of the Academy, but for the whole medical profession and for those of the general public interested in medical subjects in general, or temporarily in particular phases of medicine. The size of the Library and the number of the readers require a more complicated organization and a larger personnel than were sufficient a few years ago.

The work of the Library is controlled by three committees: the Committee on Library consisting of 9 members, and its subcommittees: the Library Publication Fund Committee, and the Committee on Museum.

The functions of the Library may best be summarized under four main heads: (A) Administration, (B) Care of Books, (C) Care of Readers, (D) Historical Library. The functions under these heads may be tabulated as follows:

#### A Administration

- (1) General Direction and Oversight
- (2) Selection of Personnel
- (3) Relations with other Libraries

#### B Care of Books in Main Library

- (1) Selecting and Ordering
- (2) Cataloguing
- (3) Shelf listing
- (4) Periodicals, Binding and Mending
- (5) Administration of Reading Rooms and Stack
- (6) Duplicate Collection and Disposal of Spare Books

#### C Care of Readers in Main Library

- (1) Reference
- (2) Circulation including Inter-library Loans
- (3) Bibliographical Research
- (4) Photostat
- (5) Messenger Service and Shipping

#### D Care of Books and Readers in Historical Library

Altogether, these many functions constitute an intricate mosaic in organization. The parts are, it is obvious, all interrelated and each in turn indispensable. The Library has in fact grown so in size and in importance that to provide less than is now available would limit seriously its usefulness to the Fellows and Members of the Academy and to the public.

The Library Committee wishes to draw attention to the following matters in respect to which the Library has fallen behind:

A First in point of importance has been the curtailment in the purchase and care of books. A sum of \$10,000 is needed for the purchase of books not bought and binding not done during the depression. Since the average increase in books is about 6,500 volumes per annum a sum requisite to purchase them should be provided regularly in the budget. The budget should provide adequately also for binding and for replacing lost or defaced books and periodicals. What the course of events has actually been concerning these matters can be quickly appreciated by reference to Figure 1. The sums needed annually for these various purposes are given in Table I. They represent a total annual increase of \$3,400.

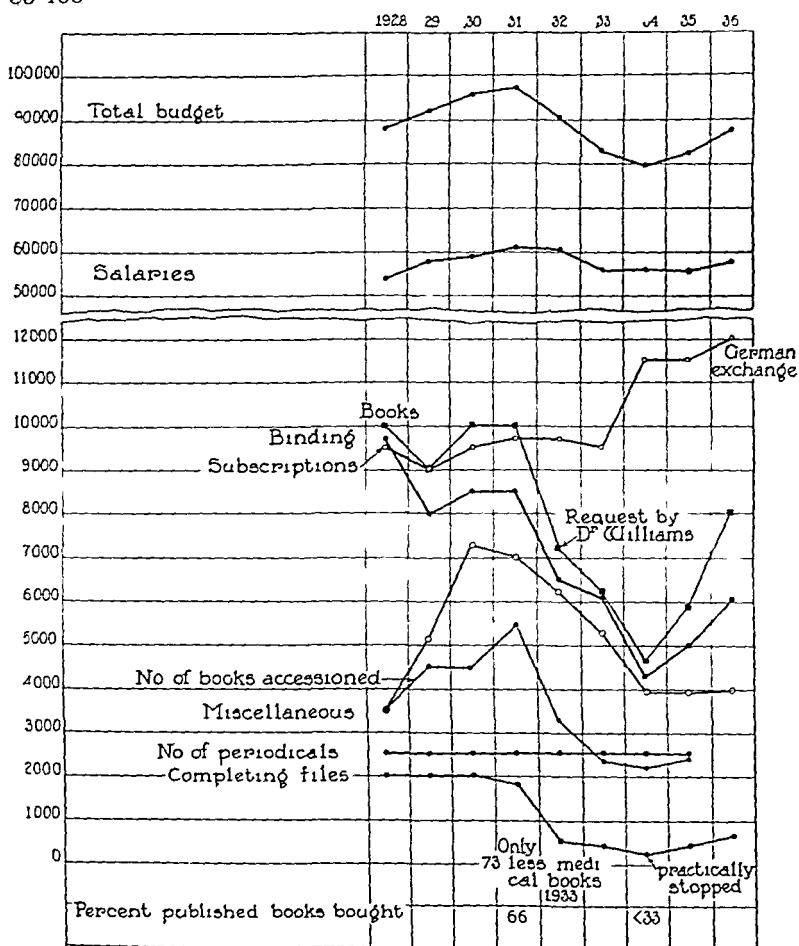


Fig 1 Library Expenditures and Acquisitions, 1928-36  
( Request by Dr Williams was to buy as few books as possible )

*B* To restore the 5 per cent salary cut of 1932, to give certain increases in salaries, and to provide additional staff adequate to care for the needs of the Library, an increase of \$11,633 96 in the annual salary-budget is desired (Table I) If new construction is carried out additional assistance will be required in three years time, increasing the budget by \$2,400

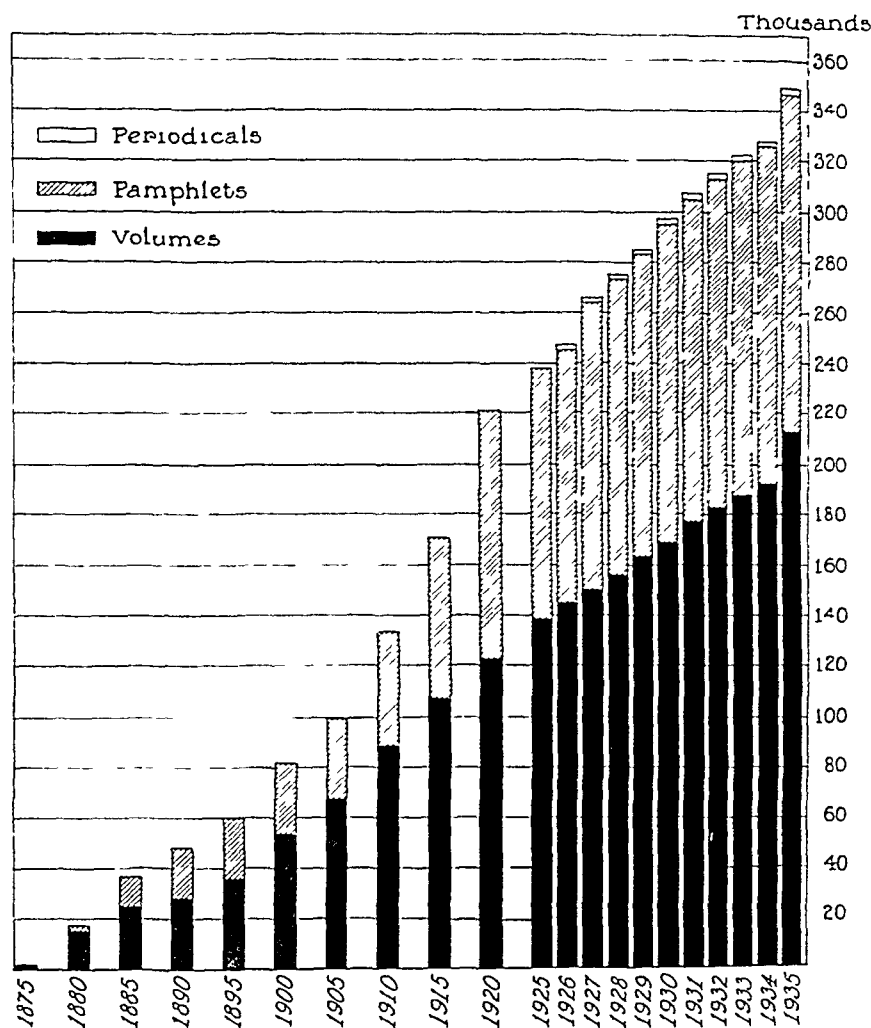


Fig 2 Number of Volumes and Pamphlets in the Library, 1875-1935, Periodicals received regularly, 1926-1935

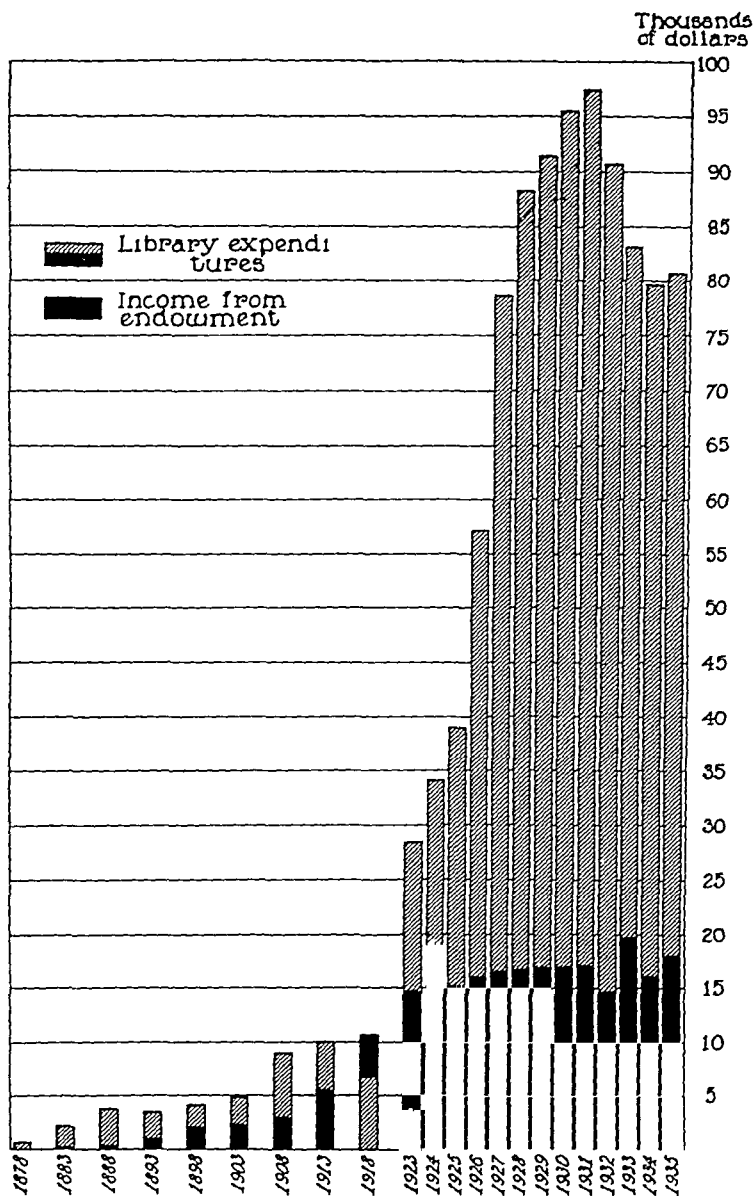


Fig 3 Library Expenditures and Income from Library Endowment, 1878-1935

C When the stacks of a library are 80 per cent full it is considered good library practice to place no more upon the shelves. In the case of our Library the stacks provided in 1926 were intended to accommodate 211 680 books. This figure equals 80 per cent of the capacity. There are now 189,808 books. Space is left for 21,872 volumes. At the current rate of purchase, about 6,500 volumes a year, new shelves will be necessary in just over three years. Besides this, one and a half of the nine floors of the stacks are given up to duplicates. These are kept for replacements and to facilitate circulation of books. Triplicates are exchanged or given away. Counting the books on the shelves of the reading rooms as well as in the stacks, we have 212,044 volumes (31 December, 1935), not counting duplicates.

A similar situation exists in the space for the catalogue. Since a single volume is on the average represented in the catalogue by 6 cards, the increase for a year in cards for the main catalogue is about 40 000. Some rearrangements of books and cards are necessary almost at once, others will be required soon. Shifting large numbers of books or cards frequently is an uneconomical procedure.

The property of the Academy permits expansion of its stacks to six times their present capacity. There is ground available running eastward from the present stacks on which two additional stacks can be built. On top of the three stacks (the present and 2 new ones) shelves can be built again as high as the present. Whatever is done in new construction, rearrangements are desirable to give necessary additional space to the catalogue and to working quarters for the Staff and perhaps for the Fellows. The expansion now proposed, doubling our stacks is calculated to serve, at the current rate of increase, for 35 to 40 years. If new study rooms are built \$36 000 00 will be required. What arrangements can be made for these various purposes has in general been discussed with the architects. All this construction and equipment would cost approximately \$294 000 00. Adopting plans depends naturally, upon the adoption of purposes by the Trustees and Council of the Academy.

TABLE I—*Library Budget*  
For the year 1936 and the year 1937

	1936	Contemplated Increase	1937 Con- templated Total
Salaries	\$55,829 61	\$11,633 96	\$67,463 60
Subscriptions	12,000 00	2,000 00	14,000 00
Books	8,000 00		8,000 00
Completing files	600 00	400 00	1,000 00
Binding	6,000 00	1,000 00	7,000 00
Supplies	2,000 00		2,000 00
Insurance	1,000 00		1,000 00
Bibliography and Photostat	500 00		500 00
Express and Messenger	350 00		350 00
Portraits and Exhibits	100 00		100 00

- 1 Total number of readers consulting the library - 1880 to 1935
- 2 Books used from stacks - 1933 to 1935
- 3 Number of Staff - 1927 to 1935

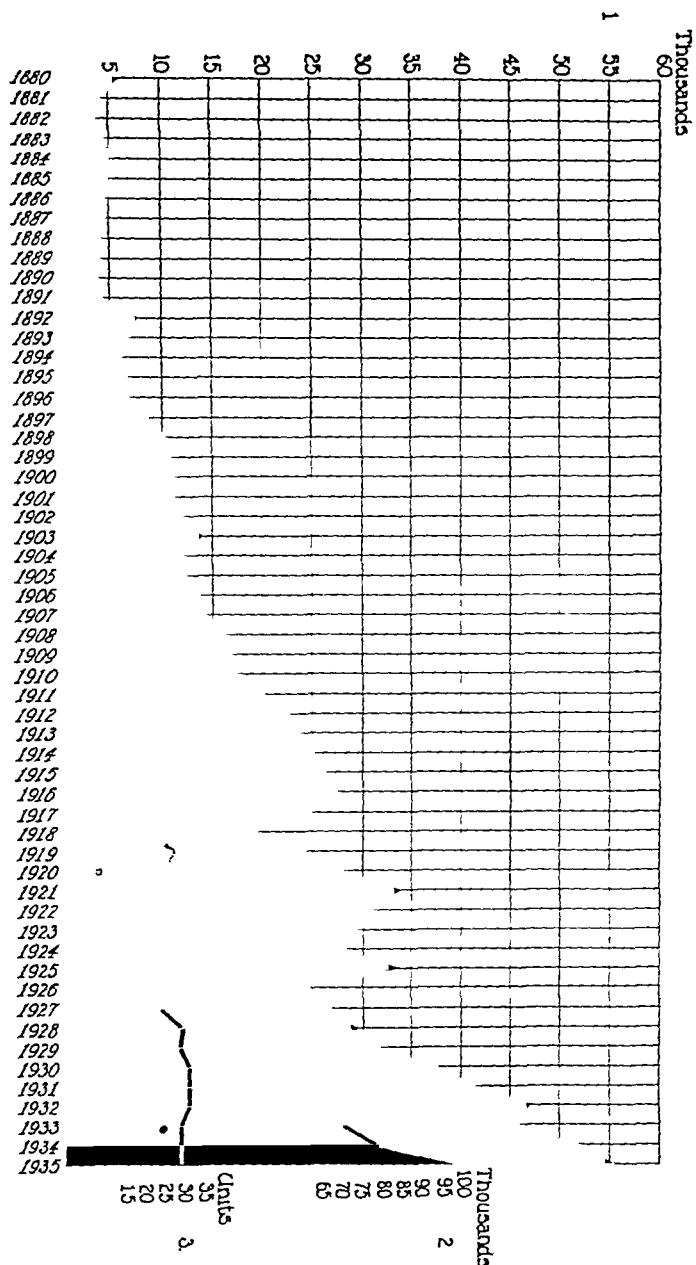


Fig 4 Readers, Books Used, and Staff, 1880-1935

## GIFTS OF MONEY

Though they are mentioned later, it seems right to list the names of those who made gifts of money to the Library during the past year. Mrs. Walter G. Ladd contributed \$100.00, Dr. Eleanor B. Kilham, Mrs. Samuel W. Lambert, Dr. M. Claudius Warsaw (through Dr. Samuel W. Lambert) each \$50.00, and an anonymous donor gave \$50.00 in memory of Mrs. Eugene H. Pool. We are extremely grateful in acknowledging these gifts which were added to the income of the Rare Book Fund and made possible the purchase of certain books long desired.

Mr. and Mrs. Carl Tucker, through Dr. Samuel W. Lambert, have given \$2,170.00 a year for three years, to provide for certain salaries in the Library. We are deeply indebted for this splendid assistance in our work. The very day this Report was finished, Dr. Lambert came in with a cheque for \$50,000.00 from an anonymous donor, the income of which is to be spent for the general use of the Library, including the purchase of books. Words fail to express our thanks to the donor and also to Dr. Lambert for this truly munificent gift.

## RARE BOOK AND HISTORY OF MEDICINE DEPARTMENT

It is with great satisfaction that this Department looks back on 1936 for in that year the cataloguing of that large block of volumes, the Streeter Collection, purchased in 1928, was finally completed. As that collection comprises about 1,800 volumes, it is easy to see why the careful research necessary in making the contents of these early books available, should have taken so long. To have reached this milestone in 1936 is enough to make the year a memorable one but we are pleased to report further that our early letters of important medical men have also been catalogued. Many of these, together with other manuscript material, have been in the Library for some years but have never before been made accessible to our readers.

These records contain true source material for historians and it is our hope that in 1937 the cataloguing of all our manuscripts will be finished. That would mean that nothing would be left on our shelves which had not been catalogued. When this has been accomplished, we hope to engage in the preparation of material for a printed catalogue of our early books with careful bibliographical annotations. A work of this kind would widely extend the sphere of usefulness of our collection so that it would be within easy reach of medical historians in every foreign land.

### *Gifts*

Our gifts this year have not been many, but have included books of importance which we have long desired. An anonymous contribution of \$50 was given in memory of Mrs Eugene H Pool. It was used to buy a copy of the great William Gilbert's *De Mundo nostro sublimari Philosophia nova*, published for the first time in 1651, forty-eight years after the author's death. Gilbert, a physician, is remembered chiefly for his work on the magnet. This work is a meteorological and cosmical treatise, "remarkable indeed," writes Silvanus Thompson, "for one speculative point, namely a suggestion that the reason why the moon always presents the same face toward the earth is because the moon, like the earth, is magnetic." Mrs Walter G Ladd gave us \$100 which went toward purchasing Andreas Caesalpinus' *De Plantis* 1583, first edition of a great work which contains the first classification of plants by their fruits. Linnaeus called Caesalpinus the first true systematist. Copies of this volume are very scarce. Our copy is of particular interest since it bears the signature of Jean François Seguer, 1703-1784, well known botanist whose *Bibliotheca botanica* The Hague, 1740, we recently purchased. A gift of \$50 from Mrs Samuel W Lambert bought for us Fabio Colonna's *ϕYTOBAΣANOC, sive Plantarum aliquot Historia* Naples, 1592, first edition of the first herbal illustrated with copper-plate engravings. From Dr M Claudius Waisaw through Dr Samuel W



Lambert came another donation of \$50 Part of this procured for us Johann Boeckel's *Anatome* Helmstadt, 1588, which contains the author's lectures on anatomy at the University in Helmstadt The rest of Dr Warsaw's gift was put with \$50 presented by Dr Eleanor B Kilham to buy a work on surgery which was issued under the name of Andreas Vesalius but in reality was compiled by Prospero Boigarucci from various authors The title is *Andree Vessali Chirurgia magna* Venice, 1569 Dr Ernest Fahnestock was kind enough to give us Andrew Boorde's *The Breviarie of Health* London, 1598 Boorde was a jolly physician and traveller of the early sixteenth century whose racy writings were extremely popular and frequently printed Also, during the past year we have received manuscript records from the New York Neurological Society, the now defunct New York Society for Internal Medicine and the New York Ophthalmological Society

### *Purchases*

It would be impossible to list the many purchases which we have been able to make in the past year, but a few of the most interesting should be pointed out There are a few volumes so scarce and hard to come by that a library which lacks them must be consoled by the fact that most collections have the same gaps upon their shelves Of such rarity are original editions of the works of Michael Servetus, who is remembered for his description of the lesser circulation Few copies of his books survived, as they were condemned to be burned with him at the stake when he lost his life for heresy We are fortunate enough to possess the well known but rare 1791 reprint of the *Christianismi Restitutio* and the facsimile of the *De Trinitatis Erroribus* ca 1721, but this year we were more than pleased to be able to add to our collection the original edition of the latter, published in 1531 Our interesting copy whose many manuscript notations make it possible to trace its descent through several Transylvanian owners, was for some years in the National Museum of Hungary

Another eminent sixteenth century figure is represented in our purchases this year, Conrad Gesner, erudite physician, who has left behind him enduring monuments in his works on botany, zoology and bibliography. The years 1551-1587 saw the publication of the beautifully printed and illustrated five volumes of his *Historiae Animalium*, one of the starting points of modern zoology. This work was several times reprinted and was translated into German. We acquired Books I, II and IV of this first edition, as well as Book III of a later edition.

Two items were added to our holdings in English books printed before 1641. The first, an anatomy written by Helkiah Crooke, physician and member of the Royal College of Physicians, was first printed in 1615. We purchased the second edition, 1631. The anatomical illustrations are for the most part poor copies of those in Vesalius. The other volume has the title *The Distiller of London*, London, 1639. In 1638 Theodore de Maverné, Thomas Cademan and others were directed to draw up and approve suitable rules "for the right making of strong waters and vinegars." Although opposed by the apothecaries, these rules were established and were printed here for the first time.

Our Americana collection was enriched by our purchase of a copy of John Brickell's *The Natural History of North-Carolina*. Dublin, 1737. The author, an Irish physician, lived for a time in North Carolina. His book was based to a great extent on Lawson's work on the same subject, but it contains additions of Brickell's on the medicinal uses of plants. Two Rush items were added to our growing list of books printed in America before 1801. Rush's interest in medicine was only slightly more important to him than his love for politics. These two tracts are *Observations upon the present Government of Pennsylvania*

Philadelphia, 1777, and *An Address to the Inhabitants of the British Settlements in America, upon Slave keeping*, New York, 1773. Of American interest, too, are manuscript letters we recently obtained which were written by

the eminent New York and Philadelphia physician, Samuel Baid and John Bartlett, surgeon in the Revolutionary Army

Our most significant addition to our reference books is Claudin's four volume *Histoire de l'Imprimerie en France au XV<sup>e</sup> et au XVI<sup>e</sup> Siècle*, Paris, 1900-1914, a beautifully illustrated work essential to anyone interested in books of the fifteenth century

#### MISCELLANEOUS

Many points concerning the welfare of the Library or its readers were discussed at the monthly meetings of this Committee, but, naturally, only a few of them can be touched upon here. There cannot escape being gaps in our collection of books on the various branches of medicine, but gaps unfortunately unknown to the staff of the Library, so it was decided to enlist the aid of the various Sections of the Academy by asking them to appoint someone to collaborate with the Librarian in trying to discover what we lack. The response was encouraging and the work has begun. Minutes of the Sections of the Academy are worth preserving and we are glad to report that during the year several sets of those of past years have been given to the Library. We have recommended that all rag paper be used in the future, and that folded sheets, which are better adapted to binding than single ones, be employed. We are pleased to say that this suggestion has been adopted. Problems concerning the work of the Reference Department were studied by a subcommittee of two. It recommended that one half-time page should be engaged on a full-time basis. The Council provided money to do this at the beginning of the summer. The subcommittee also recommended the installation of loud-speakers so that assistants need not go into the reading rooms to call readers to the telephone. The Council made it possible to engage a new assistant in the Periodicals Department.

The sum of \$10,000 00 was very generously allotted to this Committee by the Council in May for the purchase of books that we had failed to obtain owing to lack of funds and to pay for mending and rebinding books, especially those in the Rare Book and History Rooms. This sum may be drawn upon in future years until it is all expended. For some years past, the library has been closed during the summer at five o'clock in the evening except on Wednesdays when it has been kept open until half past ten for the benefit of Fellows and Library Subscribers. The suggestion was made that the Library be opened several evenings a week, but your Committee came to the conclusion that this was not possible under the present circumstances. Miss Anna Larsen was granted leave of absence of one year, from September, for study in Norway. We regret to report that Mr F I Kinsley, our Shipping Clerk, has retired after twenty-six years of very efficient service.

#### LIBRARY PUBLICATION FUND COMMITTEE

Under the chairmanship of Dr Samuel W Lambert, this Committee met on several occasions. The following gifts to the Fund are recorded with grateful thanks: an anonymous donor, and Dr Logan Clendening, each \$100 00. Dr Haven Emerson very generously turned over to us the remaining stock of Fracastorius, *De Contagione Libri iii, Translation and Notes by Wilmer Cave Wright*, 1930, for sale at the price of \$3 00. It is published under the auspices of the Library of The New York Academy of Medicine, no 2 in the "History of Medicine Series". The profits are to be returned to the Fund to find use later on in publishing another bi-lingual work. Number 5 of the Series, *How the President, Thomas Jefferson, and Doctor Benjamin Waterhouse Established Vaccination as a Public Health Procedure*, (price \$1 00), by Dr Robert H Halsey, a Fellow of the Academy, appeared in 1936 and was favourably received. No 3 of the Series, *Andreas Vesalius, Icones Anatomicae*, 1934, [1935], has been on sale during

the year. It has won admiration as a beautifully printed anatomical atlas of fresh impressions pulled from the *original* wood blocks of 1543. Copies of this magnificent work may still be obtained, and, naturally, sales of this necessarily rather expensive volume have not been very rapid. The contract for printing and publishing Miss Janet Doe's book, "A Bibliography of the Works of Ambroise Pare," is about to be signed. It will be no. 4 in the Series. We hope that Dr. Bernhard Wolf Weinberger's "Founders of American Dentistry, 1630-1800" will soon be published in the Series.

### EXHIBITIONS

We regret to say that there have been few exhibitions during the past year, though it must be borne in mind that some books are always on exhibition in the small cases in the Rare Book and History Room. An "Exhibition on John Hunter's *Natural History of the Human Teeth*" arranged by our Consultant in Dental Bibliography, Dr. Bernhard W. Weinberger, was held from 5-15 October. Miss Gertrude L. Annan, with an advisory committee consisting of Drs. Haven Emerson, Cassius Watson, and the Librarian, prepared a large "Exhibition of Books Illustrating the Growth of our Knowledge of Industrial Diseases and Accident Surgery" which was held during the Annual Graduate Fortnight of the Academy 19 October-9 November.

### DEATH OF DR. C. BURNS CRAIG

It is with deep regret that we write of the death of one of the members of this Committee. Dr. C. Burns Craig, who was elected to serve for the years 1935-1937, died on 24 February, 1936. He showed unusual interest in our work and also helped greatly in choosing books to be bought with the grant of \$1,000.00 which was made a couple of years ago by the New York Neurological Society for the purchase of material for our neurological and psychiatric collections.

## STATISTICS FOR 1936

*Donations*

## Publishers presenting complimentary books

D Appleton-Century Co, Inc	13	Paul B Hoeber, Inc	7
P Blakiston's Son & Co	1	Lea & Febiger	24
Columbia University Press	2	The Macmillan Co	1
Emerson Books, Inc	1	McGraw-Hill Book Co	1
Eugenics Publishing Co, Inc	2	Thomas Nelson & Sons	1
Funk & Wagnalls Co	1	Oxford University Press	15
Oscar Gottfried	2	W B Saunders Co	27
Hale, Cushman & Flint	1	D Van Nostrand Co	1

## Donors of twenty or more volumes

Dr Harry Aronow	28	New York Public Library	51
Dr Moses Aronson	25	Dr B F Ochs	57
Mrs William Cantle	222	Rockefeller Foundation	37
Dr A E Cohn	56	Miss Nadine Rosen	72
Estate of Dr D S Dougherty	185	Russell Sage Foundation	75
Dr Iago Galdston	20	Dr D D Stetson	48
Dr Malcolm Goodridge	81	Estate of Dr C Vinton	197
Dr A M Hellman	78	Dr J A Victor	135
Dr Carl Koller	130	Dr K M Vogel	28
Dr M J Loeb	49	Dr A I Von Sholly	32
New York Historical Society	30	Dr H I Weil	67
Dr A F A Wiggers	32		

## Donors of a large number of unbound journals and reports

Dr F M Allen	1501	Dental Laboratory Supply Co	1363
Dr Harry Aronow	170	Dr Ien Eyck Elmendorf	249
Dr S T Armstrong	216	First District Dental Society	293
Dr Moses Aronson	208	Dr Berthold Flesch	182
Dr George Biehr	348	Dr Morris Friedson	258
Dr F W Barrows	219	Dr A L Garbat	137
Dr C A L Binger	256	Dr A L Goodman	526
Dr L F Bishop Jr	683	Dr Malcolm Goodridge	178
Miss Mabel Brown	627	Dr Isaac Hartshorne	129
Dr Alexis Carrel	126	Estate of Dr Otto Hensel	900
Dr E M Cole, Jr	268	Dr W W Herrick	265
Dr E H L Corwin	214	Dr Guy Hinsdale	254
Estate of Dr C B Craig	168	Dr William Jacobsohn	225
Dr F Dearborn, Veterans'		Dr S E Jelliffe	199
Hospital, Bronx	520	Dr C R Kelley	130

Dr O R Kellev	174	Russell Sage Foundation	1053
Dr M J Loeb	304	Dr H B Sheffield	185
Mount Sinai Hospital Library	382	Martin H Smith Co	800
Municipal Reference Library	227	Dr J M Steiner	555
New York Academy of Medicine, Committee on Public Health Relations	936	Dr E C Titus	320
New York City, Dep't of Health, Bureau of Laboratories	401	E B Treat & Co	266
New York Telephone Co	225	Dr A G Tripp	158
New York University Medical College Library	183	Dr Philip Van Ingen	204
Dr H M Rathliff	338	Estate of Dr C Vinton	718
Rockefeller Foundation	2232	Welfare Council of the City of New York	194
Rockefeller Institute	209	Dr B W Weinberger	525
		Dr I S Wile	170
		Dr A F A Wiggers	383
		Dr S J Woolley	323

### Summary of donations

Books	2,498
Journals	26,566
Pamphlets	6,926

### Donors of museum material

Dr S I Armstrong	Reichert's hæmoglobinometer, Reichert's pocket hæmometer, C Zeiss hand spectroscope, Thoma-Zeiss blood corpuscle apparatus, Dudgeon's sphygmograph, and a case for records
Dr G L Brodhead	A Bossi dilator
Mr Fred Carnochan	One compound microscope, one large dissecting microscope and a box of microscope attachments and slides. These belonged to Dr John Murray Carnochan
Dr Ernest Fahnestock	One box of old instruments and a case which belonged to Dr Charles E Hackley, Harris Light Cavalry
Dr Curtenius Gillette	A pocket case of medical instruments which belonged to Dr Fidelio Buckingham Gillette
Estate of Dr F R Oastler	An electrical apparatus
Dr Joseph O'Dwyer	Two cases and one frame containing intubation instruments, a large number of miscellaneous laryngological instruments, and thirteen original drawings of intubation instruments, all of which had belonged to his father, Dr Joseph P O'Dwyer

Dr G C Robinson	Perkins tractors, together with notice of patent and testimonials
Miss Mary Hall Sayre	One small case of veterinary instruments which belonged to Dr Lewis A Sayre
Dr H B Sheffield	An X-Ray apparatus
Estate of Dr C Vinton	Seven boxes of electrodes
Dr A I Von Sholly	Etherizing equipment
Dr Sara Welt-Kakels	One case of nineteenth century amputation instruments
Estate of Dr J B White	A microscope of about 1870
Mr H B Wood	An old dental chair and a foot-engine of about 1850

### General donations

Dr John Beattie, Royal College of Surgeons, through Dr B W Weinberger	Photographs of the Hunterian Collection of the Royal College of Surgeons Reproduction of portrait of John Hunter
Mr Fred Carnochan	Five pathological drawings, seven photographs (daguerreotypes and ambrotypes)
First District Dental Society	A diploma issued to Dr F H Clark, 1841, his certificate of membership in the Society of Dental Surgeons, 1867, and two receipts for payment of dues to the Society
Dr Percy Fridenberg	Six letters containing data for biographies of some of the early members of the Section of Ophthalmology of the Academy
Dr Iago Galdston	Material representing an official campaign of a public health organization in combating tuberculosis
Mr W C Gibson	Four portraits of Ramon y Cajal
Dr R H Halsey	Twelve photostat copies of letters from Benjamin Waterhouse to Thomas Jefferson and one photostat of a letter from Thomas Jefferson to Dr Shore, September 12, 1801



Dr H H Horn	MS list of members of St John's Guild, 1875
Mr W H Hubbard	MS list of subscribers to a building fund of the Academy of Medicine, and some newspaper clippings
Estate of Dr John Mann	Six photographs of doctors, an order of exanunation, winter session, 1883-84, issued to John Mann, Jr, together with examination questions
Dr E H M Milligan	MS of a play by the donor
Mr H G Morgan	Five pictures of doctors
New York Academy of Medicine Section of Orthopedic Surgery	Minutes, 1921-1930
New York Academy of Medicine Section of Pediatrics	A book of financial accounts of the Section of Pediatrics, 1895-1912
New York Neurological Society	The New York Neurological Society Constitution, By-Laws, Officers and Members, 1935 On permanent loan, the Minutes, 1911-1932
New York Ophthalmological Society, through Dr T H Johnson	The Minutes, 1861-1932, of the New York Ophthalmological Society were placed here on deposit, with other miscellaneous material
Dr Sigmund Pollitzer	A bronze medallion, "Au Docteur Jean Darier"
Dr A V St George	A picture taken of the Deutsche Medizinische Gesellschaft der Stadt New York, 75 Jahriges Stiftungsfest, Hotel Astor, January 16, 1936
Society of Internal Medicine, through Dr W W Palmer	The Minutes of the Society of Internal Medicine, 1901-1931
Mr Stephen Thomas	A bibliography of medical articles, 1902-1936, and a bibliography of non-medical articles by William Sturgis Thomas, M D
Various donors	Twenty-two photographs
Dr S C G Watkins	Two scrapbooks, nos 19 and 20 No 19 composed of medical clippings, most carefully indexed Five unmounted clippings No 20 contains

autographed letters written by dentists during the 1880's and '90's with menu menus of dental dinners during 1884-1910

Dr. Willy Wiegand, through Dr  
Samuel W. Lambert

Twenty-eight photographs

### Donors of money

Anonymous, in memory of Mrs. Eugene H. Pool, for rare books	\$ 50 00
Anonymous, for the Library Publication Fund	100 00
Anonymous, through Dr. Samuel W. Lambert, for the general purposes of the Library	50,000 00
Dr. Logan Clendening, for the Library Publication Fund	100 00
First District Dental Society, for books on dentistry	500 00
Dr. Eleanor B. Kilham, for rare books	50 00
Mrs. Walter G. Ladd, for rare books	100 00
Mrs. Samuel W. Lambert, for rare books	50 00
Mr. & Mrs. Carll Tucker, for additional staff (gift to be continued for two years more)	2,170 00
Dr. M. Claudius Warsaw, through Dr. Samuel W. Lambert, for rare books	50 00
Total	<hr/> \$53,170 00

### Accessions

Books bought	1,984	
Bound periodicals bought	1,657	
	Total bought	3,641
Bound books and periodicals donated by Fellows and Members	626	
“ “ “ by publishers	422	
“ “ “ from other sources	1,426	
Total added		<hr/> 6,115
Books withdrawn since 1928	2,259	
Total bound books and periodicals in Library	203,428	
Total unbound books and periodicals in Library	14,998	
Total in Library, books and periodicals, bound and unbound (exclusive of duplicates)		218,426
Total octavo pamphlets in Library	120,119	
“ quarto “ “	15,542	
“ folio “ “	81	
“ MS “ “	244	
Total pamphlets in Library		135,986

*Growth of Library's Collection*  
(Exclusive of duplicates)

	YEARLY ADDITIONS		TOTAL COLLECTION IN LIBRARY				Theses
	Bound Volumes	Unbound Pamphlets	Bound	Books and Periodicals Unbound	Total	Pamphlets Unbound	
1927	5,776	3,625	150,256			114,284	
1928	6,009	3,090	156,265			117,374	
1929	7,135	2,637	163,100			120,011	
1930	7,107	3,760	169,906			125,610	
1931	8,009	1,636*	177,219			127,892*	
1932	5,732	1,526*	182,981			130,645*	
1933	4,959	1,726*	187,660			132,735*	60,005
1934	4,684	1,221*	192,027			133,865*	64,002
1935	5,599	1,409*	197,184	11,560	212,044	134,543*	69,042
1936	6,115	1,202*	203,128	14,998	218,426	135,986*	74,731

*Periodicals Department*

*Journals*

	Subscriptions	Exchange or Gratis	Total
1 American	206	484	690
2 British (except Canadian)	156	86	242
3 Canadian	4	30	34
4 French	177	47	224
5 German (excluding Austrian)	266	10	276
6 Italian	117	58	175
7 Russian	10	7	17
8 Miscellaneous (Austrian, Belgian, Chinese, Dutch, Hungarian, Japanese, Scandinavian, Spanish, etc)	135	321	456
Total	1071	1043	2114
Total in 1935			1999
Total in 1934			1906
Total in 1933			1856
New titles added in 1936			165

In addition to the 2114 journals received regularly, current numbers of 304 other titles have been received by donation, 821 annual reports and annual announcements have come from hospitals, health departments, medical schools, etc, and 79 documents (i.e., weekly, monthly, or quarterly bulletins of health departments in this and foreign countries) have been received currently. This brings the total of all serials received to 3318.

\* From 1930 on, the cataloguing of reprints has practically ceased.

## Exchanges

*Bulletin* 642 copies of the *Bulletin* go in exchange for 702 publications of other institutions

*Annual report* This goes to nearly 500 institutions in exchange for their reports

## Circulation

### Items borrowed, including interlibrary loans

	Books	Pamphlets	Journals	Borrowers
1927	3,178	1,104	3,764	765
1928	3,010	1,014	4,123	733
1929	2,772	872	4,228	765
1930	3,697	1,032	4,915	884
1931	4,453	1,027	6,147	968
1932	5,012	1,131	7,291	993
1933	5,354	1,043	6,491	1,047
1934	5,916	*930	6,950	1,086
1935	5,655	*948	8,094	1,108
1936	5,498	*743	8,962	1,000

### Interlibrary Loans

1930	637 books to 57 libraries
1931	820 books to 80 libraries
1932	1,322 books to 89 libraries
1933	2,089 books to 129 libraries
1934	2,435 books to 150 libraries
1935	2,624 books to 149 libraries
1936	2,402 books to 126 libraries

### Books, journals and pamphlets from stacks, used in Reading Rooms or borrowed

	Used in Main Reading Rooms	Used in Rare Book Room	Total used in Library and borrowed
1933	68,587		
1934	78,434		
1935	97,915	3,136	101,051
1936	101,204	3,467	104,671

This does not include the large numbers of books used from the open shelves, which we cannot estimate

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\* The gradual reduction in the number of pamphlets borrowed may be due to the fact that we practically stopped cataloguing reprints in 1930, so that most of what we have are now somewhat out of date

*Readers*

	Total Number of readers	Holidays and Sundays
1927	26,093	1,135
1928	29,239	1,519
1929	31,180	1,437
1930	37,539	1,558
1931	40,412	1,408
1932	47,042	1,716
1933	45,031	1,800
1934 (Including 816 in the Rare Book Room)	51,793	2,213
1935 (Including 1,434 in the Rare Book Room)	55,607	1,858
1936 (Including 1,482 in the Rare Book Room)	58,528	1,965

*Finance*

Books	\$ 8,267 77
Rare Book Fund Purchases	562 16
Total	8,829 93
Periodicals	11,829 19
Completing files	794 74
Binding (3,004 books)	5,739 74
Miscellaneous	3,804 36
Salaries	56,102 44
Total	\$87,100 40

In addition to the above amounts expended under the Library budget, the following sums have also been spent

First District Dental Society's Fund, for dental books	\$583 42
From the New York Neurological Society's Fund of \$1,000 for neurological books (in addition to \$75 09 spent from this Fund in 1935)	673 20
From the Reserve for Books and Binding (\$10,000 voted by the Council in May, 1936)	221 02
Rare Book Fund, special gifts for expenditure in 1936	300 00

*Bibliographical Department*

	Pieces of Work	Bibliographies Made	Income
1929	396	98	\$3,921 98
1930	365	89	3,819 37
1931	409	76	4,547 70
1932	352	97	3,793 17
1933	315	44	2,705 77
1934	237	38	2,883 79
1935	321	47	2,719 74
1936	355	37	3,227 85

This work was done for 87 Fellows of the Academy and for 57 other clients, among whom were 32 individuals, 9 organizations, and 16 commercial firms. Current references were sent regularly to 16 clients. About 750 hours' work was done for other Academy departments, for which no charge was made. The bibliographies listed include only those sufficiently complete and general to be catalogued.

### *Photostat Department*

	Pieces of Work	Income
1929	531	\$1,871 13
1930	535	1,995 11
1931	538	1,828 11
1932	531	1,425 75
1933	625	1,537 03
1934	761	2,299 45
1935	821	2,154 92
1936	1,029	2,507 61

Considerable work is also done for other Academy departments, for which no charge is made. Among this was work for the Library which would have cost \$129 75.

### *Theses*

	Catalogued	Cards sent to Columbia University
Prior to 1930	14,587	
1930	2,500	5,500
1931	2,367	2,758*
1932	3,785	2,240
1933	7,270	4,271
1934	5,328	2,776
1935	3,062	1,270
1936	3,450	1,891
	<hr/>	<hr/>
	12,349	20,706
	<hr/>	
Not yet catalogued	32,382	
Total in Library	74,731	

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\* Beginning 1931, subject cards were no longer made for Columbia.

*Disposal of Duplicates*

	Receiving libraries etc	Bound vols	Unbound jour	Theses
1930	90	1,619	9,422	
1931	71	1,446	6,727	
1932	65	2,428	6,262	5,429
1933	78	1,611	3,258	825
1934	90	1,605	10,176	638
1935	97	1,946	8,556	None
1936	113	1,457	8,799	None

*Miscellaneous*

	1930	1931	1932	1933	1934	1935	1936
Items repaired	7,093	6,692	7,715	6,842	6,114	4,997	5,467
Library-cards issued	1,212	1,376	1,665	1,563	2,777	2,000	2,458
Library subscriptions (total)	30	22	30	25	27	26	28
Library subscriptions renewed	16	13	12	17	23	16	21
Messenger deliveries for Fellows		312	277	383	283	357	371
Messenger deliveries (total)		1,269	1,246	1,121	1,041	1,103	1,153
Portraits (separate) catalogued				807	1,542	1,050	232
Portraits (in books, etc) catalogued				3,395	3,577	2,831	2,446
Shelf-list, titles added					604	764	901

## PERSONALIA

Miss Doe, the Assistant Librarian, was re-elected Secretary of the Medical Library Association, and in June attended its annual meeting at Minneapolis and Rochester, Minn. The Librarian, as one of the Curators of the Osler Library, attended the annual meeting in February at Montreal. He also read papers before the Wayne County Medical Society in November at Detroit, and before the Historical Section of the College of Physicians of Philadelphia in December.

I had the pleasure of attending, together with the Librarian, the hundredth anniversary of the Army Medical Library on 16 November, at Washington. A resolution of congratulation from the Academy was presented. Dr Malloch also represented the Bodleian Library on that occasion.

ALFRED E COHN, *Chairman*

## COMMITTEE ON PUBLIC HEALTH RELATIONS

## Report of Activities for the Year 1936

## HISTORICAL RETROSPECT

In view of the fact that this Committee completed twenty five years of continuous service in 1936, it may perhaps not be amiss to review briefly the evolution of the Committee

From the earliest days of its existence the promotion of public health has been one of the four objects of The New York Academy of Medicine. In conformity with this provision in its Constitution a standing Committee on Public Health was created in 1852. It was followed in 1858 by a Section on Public Health and Legal Medicine which existed until April 26, 1911, when at its own request it was abolished by the Council of the Academy and replaced by a Committee on Public Health. Prior to that a Committee on Hospitals was appointed by the President of the Academy on March 25, 1908, and on May 25, 1910 another Committee was appointed to represent the Academy at the budget hearings before the Board of Estimate and Apportionment. These two Committees were merged into one on May 1, 1911, after an offer had been made by Mrs. E. H. Harriman through the Bureau of Municipal Research to pay the expenses of an executive secretary in order that well considered opinions of leading medical men in this City might be made available to the public authorities as well as to the community at large. The Committee was authorized to participate in public health activities and to make studies of, and issue statements upon, matters pertaining to public health and hospitals. With the exception of the summer months, the Committee has met regularly every Monday and has carried on many studies and researches, on the basis of which it offered its guidance and opinions in many phases of community life and organization. It has, furthermore, created a tradition for the Academy and established a public health forum in the City. The activities of the year 1936 are typical of the work in the past years.



THE NEED OF A REORGANIZATION OF THE MEDICAL DIVISION  
OF THE DEPARTMENT OF EDUCATION

At the request of the Superintendent of Schools, a study was made by the Committee of the present medical and health service for the employees in the public schools of New York City, and a report based on this study was submitted to the Superintendent of Schools and the Board of Education

The study brought out the existing deficiencies of the Medical Division. Its limited personnel, consisting of a chief, four physicians on a half time basis, and a small auxiliary staff, is unable to meet the requirements of a very large service. It is inadequate to prevent abuse of sick leave privileges and to safeguard against admission of the physically and emotionally unfit into the school system, and is unable to provide a supervisory health service for the employees of the Department.

On the basis of the study the following recommendations were made

1 The work of the Medical Division of the Department of Education should be confined to the employees of the Department. The pupils are outside of its official concern. The Division should have an adequate staff, suitable quarters and proper equipment.

2 A satisfactorily equipped general medical office should be maintained in a central location in each borough, with the main office under a full time executive director in Manhattan. If this should not prove feasible, specially selected physicians in the several school districts should be designated as official departmental representatives to carry out the examinations in their own offices, under the general supervision of a full time executive director of the service. Under such an arrangement the central office would function as a clearing bureau and a repository of records.

3 The existing critical attitude on the part of members of the teaching staff toward the medical examinations by

the physicians of the Medical Division should be overcome by the provision of a system which would be above criticism. Consequently, the physicians chosen for the purpose should be representative of the profession and should include a limited number of consultants in the various specialties, appointed on an annual basis. The personality of these physicians and their standing in the profession should be such as to command the respect and confidence of all concerned.

4 Provision should be made for the employment of authoritative and dependable medical referees in disputed cases. For this purpose a board of three physicians might be appointed in each case, one representing the Department of Education, one chosen by the teacher and one acceptable to both teacher and the Department. These referees should be selected from among the recognized specialists in that branch of medicine under which the patient's infirmity comes. The findings of such boards should be considered final insofar as the administrative authorities are concerned, and action taken accordingly.

5 The Medical Division should deal with the entire range of health problems of the personnel, except treatment. It should also be charged with the examination of prospective employees to prevent persons who are unfit for service from entering upon employment which will prove hazardous for them, and to forestall their gaining a foothold in the system.

The activities of the Division should reach back into the teacher training centers. Cooperation should be established with educators and various professional groups interested in developing standards for mental and physical health, and the organization of practical health education programs in the training centers.

Following the initial appointment and during the three years' probationary period prior to permanent appointment, a record of observations should be kept of the physical and mental condition of each appointee. This record should play a part in the decision with regard to the grant-

ing of the permanent license. In addition, MEDICAL DIVISION and psychiatric examination should be required prior to the granting of the permanent license. Schools, a study of the present conditions should also be required of all medical and higher license holders. Public schools of

The scope of the work should include a study of the present activities of the Medical Division, the Board of and educational features not now provided, and assistance in securing proper medical education of the encouragement of periodic health examinations of a tion with regard to personal or mental hygiene, and the need of intelligent cooperation on the part of a small individual in the maintenance of a high standard of health and working efficiency.

It is desirable to make some provision on the part of the adjustment of special problems which arise in connection with individual cases in the course of the work of the Medical Division. Such a service would be especially helpful in establishing better working relations between the Department and the private physicians of the community.

In connection with the central office of the Medical Division there should be a staff concerned with the gathering and presentation of data for statistical purposes.

The Medical Division should take an active part in initiating and supporting efforts to improve environmental and other conditions in the schools which affect the health of the teaching personnel. It should keep in close touch with these conditions through its statistical division and otherwise.

6 All cases of absence should be reported daily to the central office of the Medical Division, instead of through intermediate channels after ten days of absence, as is the practice at present. Provision should be made to enable the Director to send a physician at once to visit any teacher reported absent, should it be deemed necessary to do so.

7 No refunds for absence on account of illness should be granted without certification by the Medical Division.

ly emergency and other absolutely necessary sur-  
geries should be permitted in the course of the  
term. The matter should be controlled by a system  
of permits issued by the Medical Division for operations  
performed outside of vacation time. No sick leave pay-  
ment should be allowed for surgical operations which have not  
been approved by the Medical Division.

The findings and recommendations of the Medical  
Division should determine the action of the administrative  
authorities of the Department when the pivotal questions  
involved are of a medical character.

10 The laws governing retirement and reinstatement  
should be recast, and a method devised to prevent the re-  
turn to service of those who are adjudged by the Medical  
Division to be physically or mentally or emotionally unfit  
for service.

11 There is need for a wider representation of the vari-  
ous medical specialties on the Medical Board of the Teach-  
ers' Retirement Board and for provision of a consultation  
service.

12 In the interest of efficiency and economy the work  
of the Medical Division and that of the Medical Examiners  
of the Teachers' Retirement Board should be coordinated.

13 A method should be devised to prevent in the future  
the retention in the service, and their enjoyment of pension  
rights and privileges, of undesirable persons among the  
teaching personnel, such as chronic absentees, malingerers,  
alcoholics, the obstreperous and uncooperative, the exces-  
sively nervous and uncontrolled, the psychopathic, and all  
other persons physically or mentally incapable of render-  
ing satisfactory service, whose presence in the classroom  
may be harmful to the pupils and whose retention is  
unfair to other teachers.

14 Steps should be taken to remove from the active  
roster all those teachers and other employees who are unfit  
for the performance of their present duties. Wherever  
possible these individuals should be assigned to positions  
better suited to their capacities.

15 The present resentment on the part of worthy teachers with regard to the deduction in pay during sick leave should be made a subject of investigation. A satisfactory adjustment of the matter is possible through the provision of adequate supervision of absences by the Medical Division.

16 Representative medical organizations should be requested to call to the attention of the medical profession the need of exercising more care in dealing with certification of illness of teachers. Efforts should be made to develop better cooperation between the medical profession at large and the Medical Division of the Department of Education.

17 The Department of Education should report to the appropriate committees of the official medical bodies those physicians who are guilty of unethical practices with regard to certification for sick leaves.

#### THE PROPOSED INSTITUTE OF FORENSIC MEDICINE

About one-fifth of the deaths in Greater New York come within the jurisdiction of the Office of the Chief Medical Examiner. The Chief Medical Examiner and his assistants perform over 3,000 autopsies annually. The vast opportunities for research and teaching inherent in the Office of the Chief Medical Examiner are to a great extent lost, owing to the lack of adequate funds, lack of facilities and lack of stimulus of organized teaching. It was therefore proposed that an Institute of Forensic Medicine be established around the Office of the Chief Medical Examiner, similar in organization and scope to the institutes of this character in some of the capitals of Europe and of Central and South America.

The plan which was worked out by the Committee and submitted to Mayor LaGuardia at his request, made provision for the suitable housing of the activities of the Chief Medical Examiner and his assistants, and for an educational organization in which the five medical schools of the City would participate. The proposed Institute would not interfere with the statutory duties and prerogatives of

the Chief Medical Examiner and his assistants. It would be possible, however, for this branch of the law enforcement authority of the City to utilize its unusual opportunities for the improvement of the service and would render the large volume of medico-legal experience available for the advancement of medical science, law and criminology. Under the plan the City would continue to provide for the salaries of the Medical Examiners, their clerical and laboratory staffs and contribute toward the cost of maintenance of that part of the building which is devoted to the work of the Chief Medical Examiner, the morgue and the laboratory.

To defray the expenditures of teaching and of the maintenance of research laboratories, of a library and of a museum of the Institute, the plan called for an endowment, the proceeds of which should be large enough for the purpose. It was estimated that an endowment of \$1,500,000 would be required.

The Institute would be incorporated and the Board of Trustees would consist of the Mayor, the Comptroller, the Chief Medical Examiner, the two local presiding justices of the Appellate Division of the Supreme Court, the deans of the five medical schools in the City, the President of The New York Academy of Medicine, and a few others.

The Institute would be available to the undergraduate students of all the colleges and would offer complete as well as short courses of instruction for physicians seeking a life career in medico-legal work, for coroners' physicians desirous of improving their skill, pathologists, toxicologists, chemists, special laboratory technicians, law students, police department officials, sociologists and criminologists.

In view of the fact that the Foundation to which application was made for the financing of the project was not in a position to grant the request, the Mayor suggested that the schema be revised on a diminished scale.

## CLINICAL CRITERIA OF SYPHILIS AND GONORRHEA

The Committee's report on "The Control of Venereal Diseases and the Problem of Prostitution in the City of New York," which was published in the March 15, 1936 issue of the New York State Journal of Medicine, helped to give impetus to the campaign against venereal diseases. The recommendations formulated by the Committee are being followed insofar as available means and hospital and clinic facilities permit. The criteria formulated by the Committee for the diagnosis of potentially infectious syphilis and gonorrhea in women have been adopted with minor modifications by the Department of Health of the City, as well as of the State. The formulation of these criteria was undertaken because the magistrates of the Women's Court are often confused by the divergent views of physicians concerning the evidence of an infectious venereal disease.

The demonstration of the spirochete in syphilis and of the gonococcus in gonorrheal infections is often difficult, even in persons who are still highly infectious. This is especially true of women. Prostitutes and vagrants are continually exposed to infection with venereal diseases, and ultimately most of them become infected. For the protection of the public, it was therefore necessary to formulate clinical criteria upon which the diagnosis might be based with a reasonable degree of accuracy, even in the absence of demonstrable specific organisms.

In women who are arraigned on a charge of prostitution or vagrancy, the following clinical manifestations and laboratory findings have been specified as the criteria for the diagnosis of gonorrhea:

- 1 The presence of the gonococcus in smears or cultures from the secretions, even when there are no clinical manifestations of the disease, is evidence of gonorrheal infection.
- 2 Purulent or mucopurulent discharge from the urethra, Skene's glands, Bartholin's glands, cervix or

rectum or any combination of these constitutes reasonable grounds to warrant a tentative diagnosis of gonorrhea even in the absence of demonstrable gonococci. Vaginitis due to the *Trichomona vaginalis*, and other non gonorrheal conditions should be differentiated.

With regard to syphilis the following criteria were formulated:

- 1 The presence of clinical evidence of primary, secondary or tertiary active lesions of the skin and mucous membranes, or
- 2 A positive Wassermann reaction in women of child bearing age, and in men and women who have acquired the disease within five years and cannot prove that they have had adequate treatment to eliminate the potentially infectious stage—namely, 20 injections of an arsenical and 20 injections of a heavy metal.

#### THE EMPLOYMENT OF OXYGEN IN THE TREATMENT OF DISEASE

In such diseases as pneumonia, coronary thrombosis, congestive heart failure, emphysema and atelectasis, it is sometimes desirable to supply oxygen to make up the want of it caused by improper oxygenation of the blood. If the patient is to be benefited the amount and concentration of the oxygen employed must be sufficient to compensate for the impairment of the oxygen exchange. It is therefore important that the physician prescribe as definitely the concentration of oxygen to be breathed by the patient as he does in ordering a dose of drugs. If improperly handled this therapy may not achieve the beneficial effects which may reasonably be expected from it. Evidence has been gathered which indicates that the equipment necessary for oxygen therapy is not always of the proper kind and that the administration of it is frequently done in a wasteful and ineffective manner, not only in private practice, but also in hospitals. The Committee collected data bear-



ing on the subject and published a report describing in detail the character of the equipment required, the need of periodic testing of oxygen concentration and of temperature and humidity, the methods of sterilizing the tents, the administration of oxygen by nasal catheters, and the hazards to life from improper equipment as well as from explosions

This report was printed in one of the Academy publications, "Preventive Medicine," for June, 1936, and in the Journal of the American Medical Association for June 20, 1936

#### INFECTIOUS DIARRHEA OF THE NEWBORN

The outbreaks of infectious diarrhea of unknown etiology among the newborn in several of the hospitals of the City, municipal and voluntary, with a high fatality rate, led to the suggestion by the Committee to the Commissioners of Health and Hospitals of the need of a painstaking study of this phenomenon, in cooperation with specially qualified persons or agencies. The study was not undertaken in view of the opinion of the Commissioner of Hospitals that the situation can be controlled by the provision of a more adequate nursing personnel than is available and by strict precautionary measures in the handling and feeding of the babies. The Sanitary Code was amended to require reporting of cases of this malady to the Department of Health

#### CONTROL OF FOODS, DRUGS AND COSMETICS

The Copeland Bill, S 5, amending the existing Food and Drugs Law, passed the Senate but failed to receive the support of the House, chiefly because of the insistence of the lower branch of Congress that the control of advertising be vested in the Federal Trades Commission and not in the Bureau of Food and Drugs of the Department of Agriculture, as was provided in the bill which passed the Senate. The recommendations formulated by this Committee after two conferences which were held at the Acad

emy of Medicine building with the representatives of the manufacturers and distributors of drugs and cosmetics, were submitted to the appropriate committees of the House and Senate

In spite of the failure of Congress to enact a law controlling the manufacture, sale and advertising of patent medicines and cosmetics, the municipal administration has not acted as yet to secure local control through registration and license, as was proposed by the Commissioner of Accounts and endorsed by the Mayor of the City in 1935. The possibility of achieving this by State legislation has been discussed.

With reference to such articles of food as water, milk and meat, modern society does not permit that the old principle of *caveat emptor* should apply. Gradually this attitude is being extended to other articles of food as well as to certain popularly advertised drugs and cosmetics because of the large increase in the use of these preparations, and because some of them contain deleterious substances.

### CITY CHARTER

Believing, perhaps too optimistically, that the structure of the City government is a matter of fundamental importance in the efficient functioning of the administrative machinery, the Committee devoted a large amount of time and thought to the sections of the Charter which apply to the Departments of Health, Hospitals, Public Welfare, Housing, Sanitation and Education. The opinions and views held by the Committee influenced to a considerable extent the Charter Revision Commission and a number of the suggestions made were incorporated in the document which was adopted by popular vote on November 3, 1936, and which will replace the present Charter on January 1, 1938.

### CITY BUDGET

From its very inception over a quarter of a century ago, the Committee on Public Health Relations has advised

with regard to the budgetary requirements of the several City departments whose work lies in the field of the Academy's interest. During the past year a great deal of attention was given to the problems and needs of the Department of Health. Stress was laid particularly on the strengthening of the Bureau of Laboratories, which has been housed in a new and capacious building, the Bureau of Food and Drugs, which has remained without a Director for more than a decade, the Bureau of Health Education, the Bureau of Tuberculosis, the Bureau of Social Hygiene, and the Bureau of Nursing.

In its communication to the Board of Estimate and Apportionment, the Committee expressed its full sympathy with the policy of stringent economy pursued by the administration, and in view of this suggested that particular consideration be given only to those of the unmet needs of the Department of Health which were essential for an efficient health service. It is not so much the expansion of health services that is needed as the proper implementing of those that exist, and competent supervision. It was for this reason that the Committee stressed the need of adequate salaries for the key positions in the Department.

The principal suggestion in the Department of Hospitals was the creation of an administrative Division of Tuberculosis and the appointment of a Director for such a Division.

#### THE HEALTH CENTER DEVELOPMENT

The Committee continued its active interest in the development of the district form of organization of the Department of Health and gave its views concerning various problems of policy and procedure in the development of the Health Center plan. In a communication to the Mayor and the Board of Estimate, the Committee urged appropriation of the necessary funds for the Health Center buildings in connection with the medical schools of the City. The trustees of Columbia and New York and Cornell Universities have voted to deed to the City sites adjoining their medical schools, and have also offered to make

available funds for the training of personnel engaged by the Department of Health from Civil Service lists and for the supervised education of various groups of professional and vocational students in public health. The Committee pointed out that by this action on the part of the authorities of the universities a remarkable opportunity has been offered to the City to assure the future development of an adequately trained personnel of physicians, nurses, sanitary and food inspectors and other Health Department agents. The City made the requisite appropriations for the purpose.

### CIVIL SERVICE

As in former years the advice of the Committee was requested and freely given with regard to the formulation of professional requirements for the various medical positions in the City service, as well as lists of competent examiners. During the past year examinations were held for the positions of Director and Epidemiologist of the Bureau of Social Hygiene, Department of Health, Assistant Director, Bureau of Health Education, Department of Health, General Medical Superintendent of the Department of Hospitals, Deputy Medical Superintendent, Department of Hospitals, Medical Expert, Workmen's Compensation Division, Law Department.

The Committee was successful in its pleading before the Civil Service Commission in opposition to placing nurses in the municipal hospitals on a Civil Service footing.

The Committee was requested to act as the friend of the court in the case relating to validity of oral tests.

Jointly, with the representatives of the Coordinating Council of the Five County Medical Societies, the Committee made an inquiry into the *modus procedendi* at the examination held early in the year for the position of District Health Officer, and rendered its report to the Commissioner of Health.

STATUS OF INSTITUTIONAL CONVALESCENT CARE  
IN NEW YORK CITY

In 1924 the Committee's first reports on the subject of institutional convalescent care were published, and ever since it has continued to take an active interest in this field. Developments of the last few years suggested the need of a general review of the situation. New York City still has the largest complement of convalescent home facilities of any city in the United States and yet only 29,000 patients are cared for annually by all the institutions combined, including the Speedwell Society. In other words, about six per cent of the total number of ward patients passing through our hospitals annually receive institutional convalescent care.

With the exception of six institutions for cardiac children and seven for orthopedics and one small institution for neurological patients, all convalescent homes are of a general character and are unable to accept patients who require more than the simplest kind of special care. While the occupancy of the special homes is often at the maximum, the homes for general care, taken as a whole, are under utilized. In addition to the lack of special facilities, the paucity of funds should be mentioned as a contributing cause of the under-utilization of available facilities. To a growing extent the convalescent homes, all of which are voluntary institutions, are becoming dependent on municipal subsidies.

The City contributes annually more than \$250,000 to the seventeen convalescent institutions which are on the approved list for the reception of so called City charges or City wards. These seventeen institutions have a total capacity of 1,374 beds. The number of patients paid for by the City and cared for in these seventeen institutions was 7,560 in 1935. Sixty-one per cent of the patients paid for by the City in 1935 came from the municipal hospitals and thirty-nine per cent from the voluntary hospitals. In order to eradicate certain evils which have grown up in the past, the Department of Hospitals, which controls the

City appropriations to convalescent homes, adopted in 1933 certain regulations governing the acceptance of convalescent patients as public charges, which in many respects are quite drastic. No O P D patients can qualify for convalescent care. Neither can patients who have passed a severe illness in their homes, even if they be on relief and have been treated by physicians of the Emergency Relief Administration. Admission to a convalescent home must be effected within ten days after the discharge of a patient from a hospital. Patients suffering from chronic illnesses are not paid for by the City. The rules specify that those suffering from heart and kidney diseases come within the designation of chronically ill, and therefore are ineligible. No patients are admitted as City cases to a convalescent home without a previous examination by a medical inspector of the Department of Hospitals. This at times causes delays in admission as well as clashes of medical opinion. The Commissioner believes that any liberalization of the present rules of the Department cannot be effected until the City is willing to appropriate larger funds and until the entire social and medical policy with regard to convalescent care is clearly determined.

In spite of the fact that the City pays only \$1.15 per patient in a convalescent home, which is considerably less than the average daily cost of \$2.00 per patient, the convalescent homes, because of the financial stringency, look upon the City cases with special favor. Voluntary hospitals are finding it increasingly difficult to procure admission for their free non-City cases and are often obliged to pay the convalescent homes for their care out of social service department funds. A situation has been created which should be remedied.

The apparent needs of the situation resolve themselves to

1. The formulation of a rational program for the effective development of organized convalescent care in this City. This might be a joint responsibility of the Academy of Medicine, the Welfare Council, the trustees of the con-

valescent homes, and the representatives of the newly created Hospital Council of the City

2 Recognition on the part of the United Hospital Fund that the convalescent homes are an indispensable complement to our hospital facilities and that a part of the funds collected for the care of the sick should be allocated to the convalescent homes on the basis of some workable principle to be determined by all concerned

3 The Board of Estimate and Apportionment and the public should be made aware of the large dependence of organized convalescent care on municipal subsidy and the need of increased grants

4 The modification of the rules and regulations of the Department of Hospitals with reference to payment for convalescent care to private institutions The projected convalescent camp on Welfare Island may or may not prove an important factor in the solution of the problem insofar as certain types of ambulatory patients are concerned

5 Provision for patients for whom the facilities of an ordinary general convalescent home are inadequate

6 Recognition of convalescent care in the provisions under the Workmen's Compensation Act

7 Periodic inspection of all convalescent homes and the grading of them in accordance with certain reasonably objective standards agreed upon by the State Department of Social Welfare

8 In the interest of economy, certain services of the convalescent homes, such as admission offices and transportation of patients, might be organized on a cooperative basis

#### SUGGESTED CHLORINATION OF JAMAICA AND FLUSHING BAYS

With the sanitary control of the water and milk supplies and the registration and supervision of carriers, the control of typhoid fever in this City is well in hand Many cases of the disease in the City are traceable to out of town sources, and some to bathing in the heavily polluted

waters surrounding the City. On account of slow tidal action some of the bays, particularly Jamaica and Flushing, are areas where heavy pollution prevails. In spite of the fact that these areas are condemned for the purpose, mothers allow their children to bathe there because of the absence of undertow. Some people eat the shellfish collected in these waters.

The Committee endorsed the recommendation made some time ago for the chlorination during the summer months of the sewage effluents. In a communication to the Board of Estimate and Apportionment the Committee urged last spring that an early appropriation be made to allow the necessary mechanical setup for the treatment of the sewage effluents in Jamaica Bay.

#### JUVENILE DELINQUENCY

Several conferences were held with the Presiding Justice of the Court of Domestic Relations after submission of the report made by the Committee in the preceding year. Referring to it the Presiding Justice made the following statement in the last Annual Report of the Court: "The report (of the Committee on Public Health Relations of The New York Academy of Medicine) speaks for itself. No comment is necessary. The recommendations have made a distinct impression and as far as possible and when possible will be adopted."

#### ACKNOWLEDGMENT OF BIRTH CERTIFICATES

Prior to 1935 it was the custom of the Department of Health to send acknowledgments of the receipt of birth certificates to physicians. As a measure of minor economy this was discontinued, and subsequently the opinion of this Committee was requested as to whether the abandoned practice should be restored. Having ascertained that many individual physicians and hospitals file the Health Department acknowledgments as proof of reported births, the Committee strongly urged the Department to resume the former practice. This has not as yet been put into effect by the Department.



## CITY RESIDENCE BILL

Repeated efforts by local legislation have been made to prevent anyone but a resident of the City from receiving appointments in the municipal government service. Although the Committee is of the opinion that residents should have priority over outsiders, it fears that the proposed limitation might prove harmful in the highly technical fields of public health, sanitation and hospital administration. A communication to that effect was sent to the members of the Board of Estimate and Apportionment and to the Board of Aldermen in opposition to the so called Lyons Bill.

## BIGGS LECTURE

The 1936 Lecture was delivered by Lord Horder, Consulting Physician to St Bartholomew's Hospital, London, on May 7th, and was devoted to the consideration of "The Eugenic Outlook in Preventive Medicine." The Lecture was published in full in the July issue of the Academy Bulletin. In view of a revival of interest in population trends in this country and a new orientation in the eugenic field, it may not be amiss to emphasize the thesis developed in the Lecture, that "eugenics, in actual fact, if we take the long view, and not the short one, is the soundest, and by far the most profitable form of preventive medicine." In our public health efforts to control disease and to increase the individual's resistance, we have been focusing more and more attention on the child, then on the infant, and recently on prenatal life. The query posed by Lord Horder is, why not go still further back?

## "ILLUSTRIOUS CONTRIBUTORS TO PUBLIC HEALTH"

Following the selection by the Committee of twenty nine names to be carved on the new building to house the Departments of Health, Hospitals and Sanitation, and the Office of the Chief Medical Examiner, Dr Charles F Bolduan, Director of the Bureau of Public Health Education of the Department of Health prepared a brief and interesting account of the achievements of the men chosen

Through the interest of Mr. Lucious N. Littauer these biographies were issued in book form under the name of "Illustrious Contributors to Public Health," and the Committee was requested to accept the proceeds from the sale of this book.

### THE PRACTICE OF APPLIED PSYCHOLOGY

With the increasing use of psychometric tests in clinics and schools, a great many people have taken up this work. Judging by the statements made by the Association of Consulting Psychologists, many persons active in this field do not possess the required qualifications, and it was for this reason that the suggestion was advanced that practicing psychologists should be licensed by the State. A draft of such a licensing bill was presented to the Committee for consideration. The Committee expressed itself in sympathy with the efforts to formulate qualifications of competency in applied psychology, but discouraged the suggested legislation. A simpler and more efficient method would be to certify psychologists through a well organized board of recognized leaders in this field, similar to the procedure used in the medical specialties. The Committee pointed out that although physicians are licensed, the certification of specialists by the several national boards has not been made any easier thereby. The suggestion offered by the Committee met with favor on the part of the Association of Consulting Psychologists.

### LEGISLATION

Among the numerous bills which were before the Legislature last year the Committee took an active interest in those which pertained to the conduct of hospitals, the length of the working day, the hospital insurance law, animal experimentation, preference in promotion of disabled veterans, Veterans' Relief administration, quack advertisements, sanitary control and inspection of milk, the practice of optometry and the amendment to the Mental Hygiene Law creating a board of psychiatric examiners.

## MISCELLANEOUS

There were numerous other matters which received consideration during the year which can only be listed, such for example as the proposed Public Health and Medical Museum in connection with the World's Fair, the serving of free milk to children in public schools who come from homes on relief, criminal abortions, licensing of foreign physicians, the requirements of the venereal disease service at Kingston Avenue Hospital, the care of handicapped children, studies on psychosomatic relationships, industrial hygiene, the applicability of violet-ray transmitting glass to schools and child-caring institutions, the employability as teachers of persons who have had luetic infections, the work of the Board of Statutory Consolidation of the City of New York and various matters pertaining to the changes in the Sanitary Code of the City

JAMES ALEXANDER MILLER, *Chairman*

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## REPORT OF THE COMMITTEE ON MEDICAL EDUCATION

The Committee on Medical Education takes cognizance of any or all matters relating to medical education in New York City or elsewhere. It maintains a Bureau of Clinical Information, the purpose of which is to collect and distribute information in regard to the facilities for clinical study in New York City. It collects and distributes information concerning opportunities for postgraduate instruction here and abroad. It is concerned with all phases of medical education, that is undergraduate, leading to the degree of doctor of medicine, graduate, including internships, residencies and fellowships, postgraduate, embracing the entire subject of the continued education of the doctor, and finally, education of the laity in medical matters, in cooperation with the Medical Information Bureau.

A consideration of the subject of undergraduate medical education by this Committee is not pressing. The faculties of the medical schools are cognizant of certain shortcomings in the curriculum and of modern tendencies in education, and will change their courses as seems best. Nevertheless, the Committee is keenly interested in the subject and is willing to offer helpful suggestions when indicated.

The question of internships and residencies is at present being studied by the New York Committee on the Study of Hospital Internships and Residencies, as the result of investigation and recommendation of this Committee. The survey being made by this Committee of all the Municipal and Voluntary Hospitals of the Greater City will no doubt furnish information on the basis of which far reaching improvements in this phase of medical education will be recommended. The Academy and the Committee on Medical Education are well represented on the New York Committee. This undertaking has been made possible by a generous grant from the Commonwealth Fund.

The third phase of Medical Education is that related to the continued education of the Doctor, that is, his continued education from the time he enters practice. It is one of the major functions of this Committee to convey such medical information to the profession as will be helpful in this, and to aid physicians in reaching educational institutions and clinics for practical instruction. The problem of postgraduate medical education presents varying, often complex, questions which are due largely to the economic difficulties involved. Physicians realize that their education must be constantly supplemented and they try to do this with the means at their command. It is apparent that the physicians in the city have great advantages over those in the country in this respect. Whereas the former may supplement their reading of medical literature by attending the various lectures given at the Academy and hospitals, clinical society meetings, operations in different hospitals and the many other opportunities the city

offers, then confreres in the country often lack these opportunities near at hand. For them daily contacts with institutions of learning, and the stimulating effects these produce, are rarely possible. But the difference does not stop here, it becomes even more apparent when one considers practical clinical work whether by attendance at dispensary clinics or refresher and specialistic courses. Whereas the physicians of the city and the metropolitan area may continue their practice while taking short courses, out of town men have to discontinue their practice for this period. This imposes a serious economic handicap on them. They have to try to get the information they seek in compressed form, and in as short a time as possible. It is this demand which has been responsible for the establishment of postgraduate schools and short courses in other institutions. They fill a need in making it possible for men to supplement their knowledge of subjects in which they feel weak, in improving their diagnostic or technical skill and, for specialists, in familiarizing them with recent advances in their specialty. The Committee on Medical Education conceives its mission in this field to include a survey of available facilities for postgraduate instruction for the purpose of discovering deficiencies and securing the cooperation of existing hospital, university or other training agencies in filling observed gaps.

The Committee on Medical Education, through membership in a joint committee cooperates with the Medical Information Bureau of the Academy in presenting a series of lectures addressed to the laity on the art and romance of medicine. The program for the 1936-37 season consists of a lecture on one evening each month from October to May by a distinguished medical man. The public is invited to these lectures which are generally popular and well attended.

In performing its several functions relating to Medical Education, the Committee on Medical Education maintains a number of subcommittees drawn chiefly from its own membership.

The Subcommittee on Postgraduate Courses views the entire field of postgraduate medical instruction in New York City for the purpose of discovering its adequacy in quantity as well as quality, and for the further purpose of encouraging the establishment of new courses when need for them is apparent. The facilities for this training offered by the several universities are accepted without further study, and are listed for recommendation to students. Postgraduate courses, other than those sponsored by the universities, are not listed for endorsement unless they subject themselves to inspection by the Committee, and upon inspection are found adequate. During the past year the Committee realized that there was a deficiency of facilities for postgraduate instruction in obstetrics. A special group was designated to study this problem. It is believed that this study may result in a material improvement in this special field in the near future.

The Subcommittee on the Bureau of Clinical Information supervises the work of this bureau which collects and gives out information regarding the current medical activities of the city, and of postgraduate medical courses offered in New York and other cities and publishes

- 1 A daily operative Bulletin
- 2 A list of approved *non* operative clinics, conferences and ward rounds
- 3 A synopsis of approved postgraduate courses offered in New York City

The Subcommittee on Programs arranges programs for the Stated Meetings of the Academy which are held twice monthly from October to May, and at times for other meetings. It also cooperates with the Sections in planning their scientific programs. During the past eight years an arrangement between the Academy of Medicine and the Harvey Society has been in operation whereby the Harvey Society conducts a scientific program for the second Stated Meeting of each month. At the first Stated Meeting of the year, which was the Annual Meeting, besides the presentation of the annual reports, there were papers on

the history of organized medicine, and the relation of the Academy to the public and to the profession. The program for the Stated Meeting of February was arranged in cooperation with the Section of Surgery, that of March was arranged in cooperation with the Section of Historical and Cultural Medicine. In April, the program was devoted to a study of the diseases amenable to splenectomy. In May, the Biggs Lecture was delivered by the Right Honorable Lord Horder on the subject "Eugenics as a Form of Preventive Medicine."

The Subcommittee on Friday Afternoon Lectures arranges for a program of twenty Friday Afternoon Lectures each year. These lectures are designed for the general practitioner. The speakers are chosen with great care so as to ensure authoritative as well as interesting presentations. They seek to present recent advances in the subject and to be essentially practical. They are uniformly well attended by the physicians of New York City and vicinity and are, we believe, highly appreciated by the profession generally.

The Committee on the Annual Fortnight arranges the Annual Graduate Fortnight, which was instituted in 1927 at the suggestion of Dr. Ludwig Kast and has since been successfully held every autumn. Its purpose is to present a symposium on a selected subject by clinical demonstrations, addresses and exhibits during a two week period. Distinguished exponents of various phases of the subject of the Fortnight are procured both for lectures and demonstrations. The medical profession, the County Society, the universities, postgraduate schools and the hospitals of New York City contribute from the rich clinical and teaching resources of this great city to make these Fortnights valuable and memorable events.

The Ninth Annual Graduate Fortnight was held from October 19 to October 31. The subject was "Trauma, Occupational Diseases and Hazards." In addition to the addresses each evening at the Academy, and an excellent exhibit, clinics were conducted at twenty-two hospitals.

Although two thirds of the registrants were from Greater New York, seventeen States and two foreign countries were represented. The hospitals, to which the Academy takes this opportunity to express its appreciation for their participation in the clinical presentations in this year's Fortnight, are

Beekman Street	Morissania
Bellevue	Mount Sinai
Beth Israel	New York
Fordham	Polyclinic
French	Post Graduate
Gouverneur	Presbyterian
Harlem	Reconstruction
Joint Diseases	Roosevelt
Knickerbocker	Ruptured & Crippled
Lenox Hill	St Luke's
Lincoln	St Vincent's

The Surgeons General of the Army, Navy and the Public Health Service as well as many large industrial organizations contributed important exhibits

During the year there have been also Subcommittees on Nursing Education, on Lectures on Heart Disease, on Courses in Syphilis, and on the Bowen Scholarship. The first of these was appointed to study certain problems presented by the New York League for Nursing Education and is still engaged in seeking a solution of this complex matter. The Subcommittee on Lectures on Heart Disease in conjunction with the New York Heart Association arranged a course of lectures at the Academy and at different hospitals on this subject which has proven most successful. At the request of the Commissioner of Health of New York City a group was appointed to arrange a series of afternoon lectures at the Academy and also a number of hospital demonstrations on the modern diagnosis and treatment of syphilis. This course is projected for the winter of 1937.



At the close of this year's activities, Dr Frederick P Reynolds who served as Secretary of this Committee for more than twelve years retired. During this long period of distinguished service Dr Reynolds contributed beyond measure to the Committee's accomplishment. The Resolutions of the Council testifying to the value of Dr Reynolds' accomplishment will be found elsewhere in the report. Dr Mahlon Ashford has been selected as Executive Secretary for this Committee as Dr Reynolds' successor.

CARL EGGERS, *Chairman*

## REPORT OF THE COMMITTEE ON SECTIONS

The average attendance at Section meetings during the year and the attendance during the two previous years are shown in the following table

	1934	1935	1936
Section of Dermatology and Syphilology	106	104	119
Section of Surgery	108	109	110
Section of Neurology and Psychiatry	248	183	179
Section of Pediatrics	227	191	169
Section of Ophthalmology	171	180	158
Section of Medicine	142	213	209
Section of Genito-Urinary Surgery	111	114	86
Section of Orthopedic Surgery	142	162	137
Section of Obstetrics and Gynecology	123	178	173
Section of Historical and Cultural Medicine	73	85	92
Section of Otolaryngology	168	169	127

The Committee on Sections, which is composed of the Chairmen of the Scientific Sections of the Academy with one of the Vice-Presidents as its Chairman, has assisted the Sections and their Advisory Committees in planning programs and in carrying on certain other Section activities.

WALTER L NILES, *Chairman*

## REPORT OF THE MEDICAL INFORMATION BUREAU

The Medical Information Bureau was organized in 1928. In warrant of its creation it was affirmed that "The recent and phenomenal progress of modern medicine, and particularly of preventive medicine, necessitates the development of a direct, and intimate channel of communication between the practitioner and the community. This is essential, not only that the public may learn to take advantage of the constant advances of modern medicine, but to the end that it may be protected against the hordes of charlatans, quacks and misguided zealots who, strange to say, thrive more than ever in this day of presumptive enlightenment."

The objectives of the Bureau were therefore defined as follows:

To facilitate the dissemination of authentic information on medical and public health matters, to stem and curtail quackery and to promote better understanding between the public and organized medicine.

Originally it was thought that the press and the radio would be the principal clients of the Bureau, and indeed during the first years of its operation most of the inquiries emanated from these two agencies. With time, however, other groups began to utilize the services of the Bureau, so that, for example, though during the eight years of its operation, the press inquiries have increased five fold, in 1936, the number of inquiries received from physicians slightly outnumbered those received from the press.

The combined inquiries received from the press and from physicians do not, however, amount to more than 43 per cent of the total, the rest emanated from private individuals, from commercial organizations, and voluntary health groups.

During the calendar year of 1936 the Medical Information Bureau received and handled 5,691 inquiries. This number represents an increase of 33 per cent over that of 1935.

The inquiries emanated from the following groups

32.5	per cent	(1865)	from private individuals
19	" "	(1072)	from physicians
19	" "	(1069)	from the press
16	" "	(910)	from miscellaneous sources
13.5	" "	(785)	from commercial organizations

It may properly be asked, what is an inquiry? Basically, it is an accounting term applied in keeping records. But in fact, inquiries vary immeasurably. Some are trivial, others are of major significance and worth. It is not feasible to catalogue the various inquiries which the Bureau receives, but they may be grouped under several headings as follows:

### *Checking on News*

The newspapers use the Bureau to check on the authenticity, and to help evaluate the "news element" of medical items. In this way the Bureau is frequently able to render service of inestimable worth in protecting the public, and also the medical profession, against exploitation by quacks and misguided zealots. Of necessity this service is not always evident to those who benefit thereby, save of course, the newspapers. At times some medical news item, though in error, has too large an element of news in it to be completely rejected. In such instances the press not infrequently attaches riders or sub-heads, giving the critical judgment of the Academy and thereby reduces the potential harm of the item. In this wise numerous remedies and cures for cancer, arthritis, glaucoma, hemophilia, and other diseases have been cautiously reported in the press.

### *Medical Features*

The cosmopolitan newspapers, as well as the newspaper syndicates, are not merely gatherers and disseminators of news but also educators of a sort. Through their

"feature" pages, and "by line" or signed articles they attempt to keep their readers abreast of developments in various fields of cultural and scientific endeavor. In recent years a corps of so called science writers has been developed and these have formed a national organization. As would be expected, medicine in its various phases is a subject frequently dealt with by these writers, and the Bureau is increasingly called on for assistance. Such inquiries differ radically from those of a spot news nature. The inquirer not infrequently comes with little more than paper and pencil, and reportorial zeal. The help given him must therefore begin from scratch, answering such questions as what is new, or noteworthy in medical development, what is its significance, where is the essential information available, what medical expert can and will discuss the subject with the writer, what, if any, illustrations are available, etc., etc.? The assistance given these feature writers is then rounded out by a review of the copy previous to its publication, by the consultant of the Bureau to whom they were referred and by the secretary.

### *The Periodicals*

The weekly and monthly magazine publications also make use of the Bureau's facilities. As they carry little spot news, most of their inquiries concern feature stories. An appreciable number of these inquiries are in the nature of requests to review articles submitted to them by lay writers or medical authors. In this way again the Bureau is able to protect the public against false and misleading counsel on medical matters.

### *Free Lance Inquiries*

There is a large body of free lance writers devoting themselves to medical subjects. These are skilled popularizers, keen to grasp and quick to exploit the social aspects of medical problems. These writers are as likely to go off on the wrong as on the right tangent. Yet with but few exceptions they are eager to be accurate and constructive. They consequently accept guidance and help with gracious thankfulness. The Bureau has served a number of these

writers during the year, and the inquiries received from such writers have continuously mounted

It is to be noted that the names of the Bureau's consultants practically never appear in these articles, while those of the Bureau, and of the Academy, are mentioned only when permission is granted. Much of this work therefore is carried on "behind the scenes"

### *Commercial Advertisements*

The Bureau serves the newspapers, magazines, and radio stations of New York City in reviewing advertisements offered to them for publication. The Bureau of course does not exercise the functions of a censor, but its advice is usually accepted and acted upon by those consulting it. In this connection the Bureau also serves the Better Business Bureau and the Federal Trade Commission, in securing expert medical judgment concerning patented remedies and the like. During the year the Bureau has arranged to have several of its consultants serve as expert witnesses at Federal Trade Commission hearings, notably in connection with nostrums sold to the public for the cure of deafness, rheumatic fever, and weight reduction.

### *Interpreting the Activities of the Academy to the Public*

No small part of the Bureau's activity is devoted to acquainting the public (medical included) with the activities of the Academy. This service takes the form of releases to the press. The releases may be in the shape of program announcements, though more frequently they are abstracts or digests of addresses delivered at the Academy. In this manner public notice was given during 1936 to the Biggs Memorial Lecture, by Lord Horder, the Graduate Fortnight addresses, by Doctors Pool, Sigerist, Moorhead, F. Kennedy, Gibson, Joslin, R. Kennedy, Strauss, Stookey, Fay, White and Judge Steinbrink, the 90th Anniversary Discourse by Dr. James G. Rogers, the address of the President, Dr. Pool, at the Annual Meeting of the Academy, on "The Relations of the Academy to the Public and the Profession", the Inaugural Address of the President of the

Medical Society of the County of New York, the three Thomas W Salmon Memorial Lectures, by Dr Samuel T Orton, and others All told 40 releases were issued during 1936 A number of these were devoted to the activities of the Sections of the Academy, of the Public Health Relations Committee, of the Committee on Medical Education, and of the Medical Society of the County of New York

Most of these releases were published in the press, and a number of them were printed in various professional periodicals

### *The Education of the Public*

The education of the public is the basic motive of the Medical Information Bureau, and it is furthered by indirection in the above described activities However, the Bureau in addition conducts several more direct educational services These are radio talks, a daily news column, and Lectures to the Laity During 1936, the Bureau scheduled and arranged for the delivery of 404 radio talks These were delivered over 11 radio stations Included in this number are 52 weekly talks given by Fellows of the Academy on what is known as the Academy Hour broadcast from WABC on a nation wide chain of radio stations The response to the Academy talks has been gratifying During 1936, 5285 letters were received from radio listeners, requesting copies of the talks

In the scheduling of the 404 radio talks the Bureau received excellent cooperation from the New York Tuberculosis and Health Association Fifty-two voluntary and official health organizations participated in the delivery of the radio talks

### *Daily Health Column*

During 1936 the Bureau prepared and issued through the Associated Press 300 daily health articles Since January 1, 1930, the Secretary of the Bureau has composed one article daily for every weekday in the year on some medical topic of interest to the lay public These articles are syndicated by the Associated Press and are published by some

two hundred newspapers throughout the country, whose reading public is estimated at ten million

### *Lectures to the Laity*

This series of monthly lectures to the public was initiated in 1935 and has been conducted, since, through 1936. The purpose of these lectures, has been aptly defined by Dr Pool in these words, "Until recently the public knew little about the physiologic basis of their lives and bodies. Prescriptions being written in Latin, they did not even know what they were taking when they were indisposed. This quasi-secrecy is not in keeping with modern trends. It is appropriate therefore, that we should 'let down the bars' and enable the public to see clearly the workings of the medical and scientific mind. A more cordial and confident spirit will thus be engendered."

The lecturers delivering these addresses during 1936 included Doctors Harlow Brooks, Benjamin P. Watson, Foster Kennedy, Elmer V. McCollum, George Draper, Smith Ely Jelliffe, Francis G. Benedict and Charles R. Stockard. The public attended these lectures in large numbers, filling all of Hosack Hall in practically every instance. The public's interest in these lectures is further attested to in their publication by D. Appleton-Century Company, and in the favorable reviews accorded them in the public and professional press.

The lectures are under the supervision of a special committee in the membership of which is represented the Committee on Medical Education.

Acknowledgment should here be made of the contribution of \$200.00 generously made by Dr. Oirm Sage Wightman, to help defray the expenses of the Lectures to the Laity.

### *Cooperation of the Bureau with Other Medical and Voluntary Health Organizations*

In a variety of ways the Bureau is called on to cooperate with various medical and voluntary health organizations,

principally in the promotion of their educational activities During 1936 such cooperation was given to the National Tuberculosis Association, American Nurses Association, American Public Health Association, American Society for the Control of Cancer, New York Heart Association, New York Diabetes Association, New York League for the Hard of Hearing, and others

During the Annual Meeting of the Medical Society of the State of New York, the Bureau cooperated in publicizing the programs and had full charge of the radio program arrangements As a part of this activity, the Bureau arranged for 29 radio addresses, and for the first time, succeeded in having 9 addresses "picked up" from the meeting hall of the Waldorf-Astoria Hotel This program was of two hours duration, in which three stations, namely, WEAf, WOR and WEVD participated

*Cooperation with the Medical Society of the County of New York*

Throughout the year the Medical Information Bureau served the Medical Society of the County of New York in presenting its activities to the public

The Medical Information Bureau would hardly be able to render the above enumerated services were it not for the excellent cooperation received from the officers of the Academy and the secretaries and membership of the other committees and of the different Sections of the Academy The Bureau also draws heavily upon the Fellowship of the Academy and the 101 consultants to the Bureau

JOHN J MOORHEAD, *Chairman*



## REPORT OF OFFICES AND MEETINGS AT THE ACADEMY

During the year the following organizations have maintained their offices in the Academy building

American Otological Society, Inc  
American Psychiatric Association  
Committee on Emotions and Health  
Committee on Religion and Medicine  
First District Dental Society  
Medical Society of the County of New York  
Medical Society of the County of New York, Workmens' Compensation Bureau  
Medical Society of the State of New York  
Medical Society of the State of New York, Public Relations Bureau  
National Committee on Maternal Health, Inc  
New York Physicians' Mutual Aid Association  
New York Society for the Relief of Widows and Orphans of Medical Men

Meetings have been held in the Academy building by the following organizations

American Academy of Ophthalmology and Otolaryngology  
American College of Surgeons, New York Credentials Committee  
American Hungarian Medical Association  
American Otological Society, Inc, Central Bureau of Research  
American Otological Society, Inc, Committee on Meningitis  
American Society for Anesthetists  
American Society of Regional Anesthesia  
American Society for the Study of Arthritis  
American Surgical Association, New York Members  
Association of Italian Physicians in America  
Biological Photographic Association, New York Chapter  
First District Dental Society, General and Sections  
German Medical Society  
International College of Surgeons  
Jewish Memorial Hospital  
Medical Association of the Greater City of New York  
Medical Society of the County of New York, General and Committees  
Medical Society of the State of New York, General  
Midtown Dental Society  
Milbank Memorial Fund, Conferences  
National Committee on Maternal Health, Inc  
National Society for the Advancement of Gastro-Enterology  
New York Cardiological Society

New York Diabetes Association  
 New York Endocrinological Society  
 New York Heart Association, Heart Committee of the New York Tuberculosis and Health Association  
 New York Institute of Clinical Oral Pathology  
 New York Neurological Society  
 New York Society for Anesthetists  
 New York Society for Clinical Psychiatry  
 New York Society of Graduates in Medical Gymnastics and Massage  
 New York Society for Thoracic Surgery  
 New York Surgical Society  
 North Atlantic District of the American Association of Medical Social Workers  
 Pan American Medical Association, New York Chapter  
 Society of Medical Jurisprudence  
 Society for the Prevention of Asphyxial Death  
 Society for Psychotherapy and Psychopathology  
 Speedwell Society

Accommodations, free of charge, have been granted during the year to

Bellevue Staff  
 Biological Photographic Association, New York Chapter, Exhibit  
 Department of Health, Examination of Epidemiologists  
 Department of Hospitals, New York City, Advisory Council  
 Emergency Relief Bureau, Medical and Nursing Service  
 Fracture Committee  
 Harvey Society  
 Manhattan State Hospital, Medical Board of Visitors  
 Medical Society of the County of New York, Workmen's Compensation Bureau  
 National Conference on Nomenclature of Diseases  
 New York Committee on the Study of Hospital Internships and Residencies  
 New York Pathological Society  
 New York Physicians Art Exhibit  
 New York Roentgen Society  
 New York Society for Experimental Biology and Medicine  
 New York State Board of Medical Examiners, Grievance Committee  
 Thomas W. Salmon Committee on Psychiatry and Mental Hygiene  
 Thomas W. Salmon Memorial Lecture

### MEMORIAL MEETINGS

Dr. Hulow Brooks

Dr. Max Rosenthal

Dr. Frankwood E. Williams

## CHANGES IN MEMBERSHIP ROSTER\*

## HONORARY FELLOWS ELECTED IN 1936

Abbott, Maude E—B A , M D , C M , LL D , Montreal  
 Cannon, Walter Bradford—A B , A M , M D , Sc D , LL D ,  
 Cambridge, Mass

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AUTHORS ALONE ARE RESPONSIBLE FOR OPINIONS EXPRESSED IN THEIR CONTRIBUTIONS

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## SOME FUNCTIONS OF THE HYPOTHALAMUS

Harvey Lecture, December 17, 1936

S W RANSON

Professor of Neurology,  
Northwestern University Medical School, Chicago

I appreciate the honor of appearing before you as a Harvey Lecturer, but I know that this honor comes to me, not as an individual, but as the representative of a group. The work which I shall report has been done in large part by my associates, Drs Magoun and Fisher, and by former associates, Drs Ingram and Kabat.

The hypothalamus is that small division of the brain which surrounds the lower part of the third ventricle. It lies at or very near the center of the head, immediately behind the optic chiasma and above the hypophysis with which it is connected by the infundibulum.

Damage to the hypothalamus, such as is caused by tumors restricted to this part of the brain, produces quite characteristic symptoms which may appear in varying combinations. The syndrome includes adiposity, polyuria, subnormal temperature, somnolence and sometimes emotional disturbances. In order to understand these symptoms it has been necessary to investigate the normal physiology of the hypothalamus and also to inquire what part, if any, the hypophysis takes in their production.

It has been claimed and quite generally believed that venous blood from the hypophysis is carried through a special system of portal veins into the capillaries of the hypothalamus and that in this way hypophyseal hormones

can act directly and selectively on the hypothalamus<sup>1,2</sup> This idea has recently been shown to be false Wislocki and King<sup>3</sup> have found that the blood from the hypophysis is drained through ordinary veins and that there is nothing more than a capillary anastomosis between the vessels of the hypophysis and those of the hypothalamus

Another way by which hypophyseal hormones could reach the hypothalamus would be by direct transmissions into the cavity of the third ventricle<sup>4,5</sup> Cushing<sup>6</sup> believes that from the ventricular fluid this hormone may penetrate to and stimulate parasympathetic centers in the hypothalamus, but the evidence for all this is rather indirect On the other hand, as will be shown later in connection with the discussion of diabetes insipidus, it has been demonstrated that the function of the posterior lobe is subject to the control of nervous impulses reaching it from the hypothalamus by way of the supraoptico-hypophyseal tract

Because of the nervous and possible hormonal connections between hypothalamus and hypophysis it has come to be generally believed that these two structures are associated in function The close topographic relation between the two and the resulting difficulty in making lesions in one without involving the other has made it difficult to separate sharply the functions of each Moreover, tumors in the one are likely to press on or invade the other, so that tumors of the hypophysis are likely to produce hypothalamic symptoms and vice versa For this reason it has been extremely difficult to determine which functions are purely hypothalamic, which are purely hypophyseal and which are to be assigned to a complex hypothalamico-hypophyseal mechanism

A good illustration of this difficulty is furnished by the adiposogenital syndrome frequently produced by tumors involving the structures under discussion Shall this be attributed to a disorder of the hypothalamus, of the hypophysis or of a complex hypothalamico-hypophyseal system?<sup>6,7</sup> Dr Philip Smith<sup>8</sup> has shown that removal of the main body of the hypophysis by the parapharyngeal ap

proach, leaving the infundibulum and pars tuberalis in place and not injuring the hypothalamus, causes atrophy and loss of function of the genital glands without adiposity. On the other hand, injection of chromic acid into the hypophysis by the temporal approach resulted in adiposity associated with genital dystrophy. Transplantation of anterior pituitaries into hypophysectomized males caused structural and functional restoration of the testes. These experiments show conclusively that the genital dystrophy is due to deficiency of the anterior part of the hypophysis. Smith thought that the adiposity was probably due to associated injury to the hypothalamus but this conclusion is not binding because no report was made of the extent and location of such hypothalamic injury and because the possibility was not excluded that the chromic acid may have caused some dysfunction of the pars tuberalis or of the often very considerable remnants of the anterior lobe.

#### DIABETES INSIPIDUS

Diabetes insipidus has furnished as perplexing a problem as has adiposogenital dystrophy, since it has developed in some cases as a result of tumors confined to the hypophysis and in other cases as a result of tumors confined to the hypothalamus, and since it can be produced in animals by properly located lesions in either of these two structures. This problem now appears to have been solved. There is good evidence that the flow of water through the kidney is held in check by an antidiuretic hormone secreted by the posterior lobe of the hypophysis which is under nervous control exerted by the hypothalamus. The antidiuretic function of this hypothalamico-hypophyseal system is lost as a result of properly placed lesions in either the hypothalamus or the hypophysis.<sup>9 10 11 12 13</sup>

The hypothalamus is situated below the level of the thalamus in the lateral wall and floor of the third ventricle and it extends from the posterior border of the optic chiasma backward to include the tuber cinereum and mammillary bodies. From the tuber the infundibulum extends downward to the pars nervosa or posterior part of the hypo-



physis This develops as an outgrowth from the brain and is composed of unmyelinated nerve fibers and of modified neurological cells known as pituicytes<sup>14</sup> The anterior part develops from the pharyngeal epithelium and has a glandular structure

The photograph shown in Fig 1 illustrates the close topographic relation of the hypothalamus and hypophysis in the cat In the past, investigators have been hampered by the difficulty of producing lesions in either of these structures without damaging the other It is impossible to remove the entire hypophysis including its pars tuberalis without damaging the hypothalamus, or to reach the hypothalamus by the subtemporal approach without stretching the hypophyseal stalk with the possibility of damaging the blood and nerve supply of the hypophysis

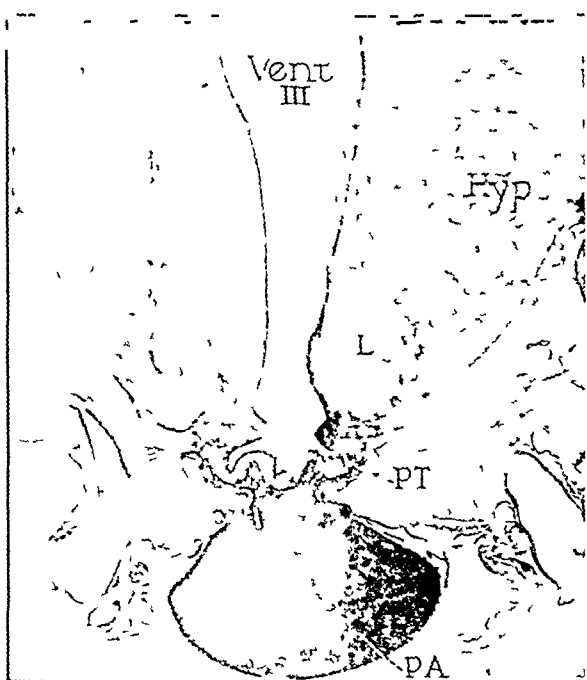


Fig 1 Frontal section through the hypothalamus and hypophysis in the cat Hyp, hypothalamus, L, electrolytic lesion, PA, pars anterior of hypophysis PT, pars tuberalis of hypophysis, Vent III, third ventricle

We have been able to get around this difficulty by using the Horsley Clarke stereotaxic instrument. With this instrument it is possible to insert from above, through the cerebral hemisphere and thalamus, a fine electrode, insulated except at its tip, and to make accurately placed electrolytic lesions in the hypothalamus without disturbing the infundibulum or hypophysis.

A diagrammatic representation of a mid sagittal section through the hypothalamico hypophyseal region of the cat is shown in Fig 2. The ventricular cavity is continued through the stalk into the posterior lobe of the hypophysis. The pars intermedia surrounds the pars nervosa and with it forms the posterior lobe which is separated from the pars anterior by the interglandular cleft. The pars tuberalis surrounds the stalk and rests against the under surface of the hypothalamus. Nerve fibers enter the pars nervosa from the hypothalamus. These are grouped in two bundles, the larger of which is known as the supraoptic hypophyseal tract. It arises chiefly from the supraoptic nucleus and courses near the ventral surface of the tuber through the ventral wall of the stalk into the pars nervosa. Bilateral lesions so placed in the hypothalamus as to interrupt this tract on both sides of the brain regularly cause diabetes insipidus. Subsequent microscopic examination of

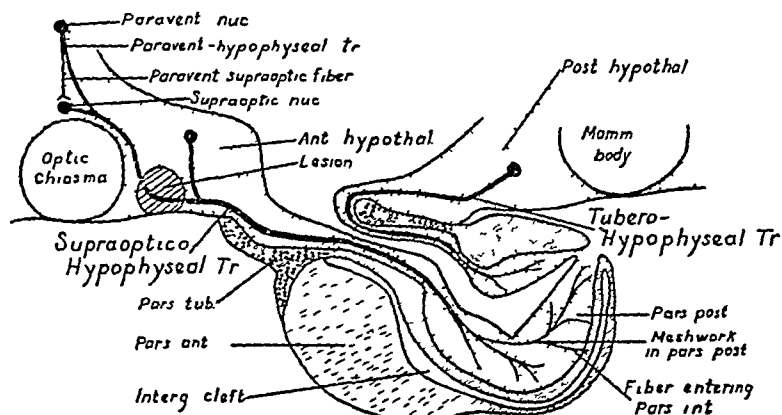


Fig 2 Diagram of a median sagittal section through the hypothalamus and hypophysis. Reproduced from the *Anatomical Record*

the brain shows degeneration of the tract, atrophy of the supraoptic nucleus and atrophy of pars nervosa of the hypophysis. Lesions behind the infundibulum destroying the tubero hypophyseal tract do not cause diabetes insipidus, nor do lesions still farther back in the mammillary bodies.

In silver stained longitudinal sections of the infundibular stem from the normal animal, the supraoptico-hypophyseal tract forms a conspicuous strand, but in experimental diabetes insipidus the tract almost completely degenerates. The normal pars nervosa contains a dense meshwork of unmyelinated fibers which reach it from the hypothalamus. In an atrophic pars nervosa of an animal with diabetes insipidus a few nerve fibers derived from the tubero hypophyseal tract persist, but the vast majority of the fibers have degenerated and disappeared as a result of the interruption of the supraoptico hypophyseal tract.

As a result of the interruption of the supraoptico-hypophyseal tract there occurs also an atrophy of the supraoptic nucleus. The atrophy involves a complete disappearance of most of the cells of the nucleus and those which remain are shrunken, and abnormal in appearance. The supraoptico hypophyseal tract is well developed in the monkey in spite of the statements made by Mahoney and Sheehan<sup>15</sup> and Gagel and Mahoney<sup>16</sup>. When experimental diabetes insipidus is produced in this animal the tract degenerates along with its ramifications in the pars nervosa and there occurs an atrophy of the supraoptic nucleus exactly as under similar conditions in the cat.<sup>11</sup>

When a section of the hypophysis from a cat with diabetes insipidus is compared with a similar section from a normal cat, the pars nervosa is seen to be greatly reduced in thickness and this atrophy has resulted in an enlargement of the central cavity and of the interglandular cleft. The pars intermedia is histologically normal. In most instances it is surrounded by a ring of colloid-like material which fills the widened interglandular cleft. The significance of this colloid-like material is still unknown.

The atrophic pars nervosa contains an increased amount of connective tissue, as shown by the Van Gieson stain and a marked increase in the number of cells as seen in cresyl violet preparations. The large branching cells or pituicytes, characteristic of the normal pars nervosa, disappear. Their place is taken by a large number of cells of a different but undetermined type, causing a marked increase in cellularity.

Investigation of the development and course of the polyuria and polydipsia has brought to light a number of interesting facts. Fig 3 shows the urine output and fluid intake in a typical case of diabetes insipidus in the cat.

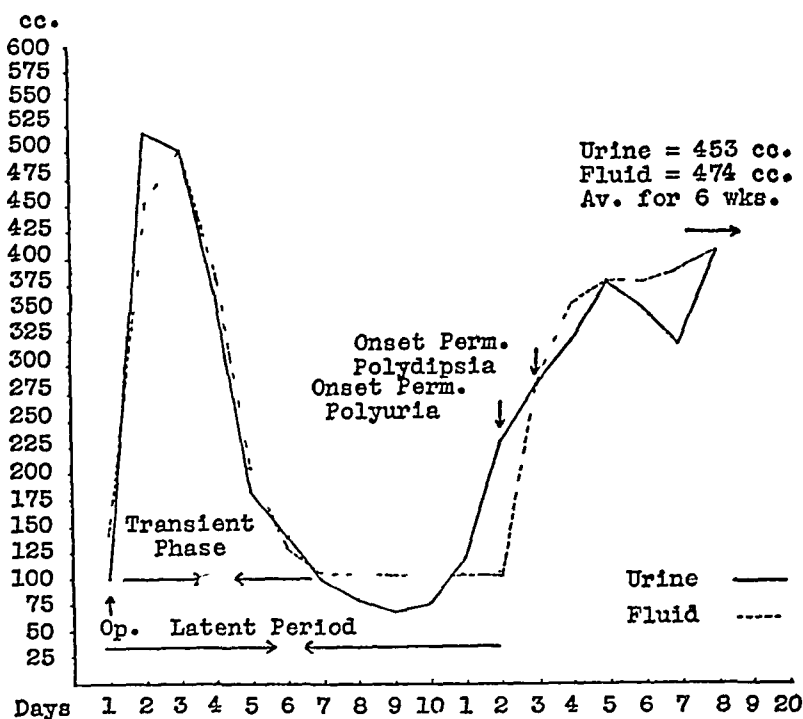


Fig 3 Graphic representation of the course of the polyuria and polydipsia in a typical case of experimental diabetes insipidus in the cat. *Reproduced from the Anatomical Record*

There are two phases, one transient and the other permanent. The transient phase is indicated by the first hump in the graph. On the day after the operation the urine output and fluid intake begin to increase and may reach 500 c c or more. After 4 or 5 days the water exchange returns to normal where it remains for about a week. Then around the 12th day, in the great majority of cases, the onset of the permanent phase is observed. It is very important to note that there is first an increase in urine output, the fluid intake lagging behind. This primacy of the polyuria is observed regularly during the onset of the permanent phase, after which the polyuria and polydipsia increase gradually and may reach a constant level within about a week. In this case the daily urine output averaged 453 c c for 6 weeks before the animal was killed. Once established, the disturbance persists indefinitely. We have kept a number of cats for more than 6 months and one for 9 months.

Table I gives the average daily water exchange of 8 of our cats. These were the cats which showed the most marked diabetes insipidus and the figures set down in the chart are those for the period of greatest polyuria. The daily urine outputs ranging from 543 to 939 c c are, therefore, the maximal results obtained. In most of the cats

TABLE I  
AVERAGE DAILY  
WATER EXCHANGE OF CATS WITH DIABETES INSIPIDUS  
DURING WEEK OF GREATEST INTENSITY

<i>Cat No</i>	<i>Urine Output</i>	<i>Specific Gravity</i>	<i>Fluid Intake (milk + water)</i>
D121	939	1.006	1166
D90	769	1.005	929
D64	673	1.008	788
D49	643	1.005	630
D9	580	1.004	708
166	591	1.005	584
D73	539	1.009	606
D102	543	1.011	566
16 normal cats	94	1.028	94

with diabetes insipidus the daily output averaged around 300 or 400 c c. In 16 normal cats the daily output averaged 94 c c. The low specific gravity of the urine and the high fluid intake should also be noted.

The content of pressor, oxytocic, and antidiuretic substance in three normal cat's hypophyses and in four hypophyses with atrophic posterior lobes obtained from cats with diabetes insipidus, has been determined for us by Dr Oliver Kamm of Parke, Davis and Company. Whereas the normal glands contained 7.5, 6.0 and 5.4 pressor units respectively and 2.5, 3.5 and 2.16 oxytocic units, the glands with atrophic posterior lobes were practically inactive. A similar marked diminution was found in the antidiuretic activity. A normal gland contained 4.0 antidiuretic units, while two glands with atrophic posterior lobes contained little or none of this substance.

The results obtained from two monkeys with diabetes insipidus were similar in all essential respects to those obtained from the much larger number of cats and make it evident that the information obtained from the cats is directly applicable to primates.

It is important to remember that the permanent polyuria did not begin immediately after the lesion was placed in the hypothalamus but after a latent period of about 12 days. In the majority of the experiments a transient polyuria occurred the day after the operation but quickly subsided. We do not know what is the significance of this transient polyuria or what relationship, if any, it bears to the permanent phase. Certainly the relationship is not binding. Eight of our cats with marked diabetes insipidus failed to show the initial transient polyuria, and it was observed in only one of the two monkeys. Also, the intensity of the transient phase bears no clear relationship to the intensity of the permanent phase. We have observed animals which developed a marked permanent polyuria, although the transient phase had been slight, and others which developed slight permanents after marked transients.

Another point of interest is the relative constancy of the latent period before the onset of the permanent phase, namely, around 12 days. The latent period probably means that it takes this long for the pars nervosa to undergo degeneration or for the hormones which it contains to be absorbed.

We have had available for study 72 cats in which this disturbance in water balance has been permanent. Of these, 64 have been killed and autopsied and 8 are living in the laboratory. Diabetes insipidus was also produced in two monkeys. At this time it has been possible only to summarize briefly the results obtained. The detailed evidence has in part been published elsewhere<sup>9, 13</sup> and it is all being brought together for publication in monograph form.

That diabetes insipidus is a hormonal disturbance due to deficiency or absence of antidiuretic principle secreted by the posterior lobe seems evident from the constant occurrence of atrophy of the posterior lobe in our cats and monkeys and also from the small amount of antidiuretic hormone present in the atrophic glands subjected to assay, the primacy of the polyuria, and the fact that the polyuria and polydipsia can be controlled by the injection of adequate doses of pitressin.

The main objection to the acceptance of the theory that diabetes insipidus is caused by a deficient secretion of antidiuretic principle by the posterior lobe is that total hypophysectomy does not result in this disorder. This objection is beginning to lose its force because of recent experimental evidence pointing to a participation of the anterior lobe in the regulation of water metabolism. Von Hann<sup>17</sup> in 1918 first promulgated the theory that normal water metabolism is maintained through an antagonism between the posterior and anterior lobes of the hypophysis, because diabetes insipidus was found to occur clinically only if the posterior lobe was destroyed while the anterior lobe remained intact. Destruction of both lobes failed to cause polyuria. Richter<sup>18</sup> has presented evidence in favor

of the von Hann theory. He reported that total removal of the hypophysis produced a temporary polyuria in 28 rats, a permanent diabetes insipidus in none, while removal of the posterior lobe alone resulted in a permanent polyuria. He concluded that the degree of the permanent diabetes insipidus seems to depend on the amount of the anterior lobe remaining intact.

Richter's observations on the rat have been confirmed in the cat.<sup>13</sup> Since the infundibular stem is composed of the same kind of tissue as the pars nervosa it is necessary that this should be removed along with the posterior lobe. It was found that permanent polyuria followed such removal in the cat providing the anterior lobe was left relatively intact.

That the same factors are involved in the production of diabetes insipidus in man is shown by recent observations of Biggart<sup>10</sup> who this year reported two cases in both of which there was involvement of the supraoptic nuclei and of the posterior lobe.

Our conception of the pathological physiology of diabetes insipidus represents a combination of the von Hann theory with the view that the hypothalamus regulates the secretory activity of the pars nervosa through the supra-optico-hypophyseal system. An adequate injury to this system leads to a deficiency of the antidiuretic substance. The diminution in the amount of this hormone brings about a primary polyuria which is followed by a secondary and compensatory polydipsia. The polyuria which develops can be thought of as representing the resultant of diuretic processes in the body unchecked by an antidiuretic mechanism. These diuretic processes are normally under the control of the anterior lobe of the hypophysis and the polyuria may, therefore, be thought of as resulting from an uncompensated activity of this gland. In this sense, then, one may speak of diabetes insipidus being caused by a disturbance of the equilibrium normally obtaining between the posterior and anterior lobes of the hypophysis. The anterior lobe can be thought of as exert-



ing its diuretic influence through its general control over metabolism and activity, rather than through a specific diuretic hormone

### THE IMPORTANCE OF THE HYPOTHALAMUS FOR SYMPATHETIC ACTIVITY AND EMOTIONAL EXPRESSION

There are two very different channels through which the hypothalamus can exert its influence upon the body. One channel is formed by the nerve fibers running to the pars nervosa of the hypophysis and the hormone or hormones secreted by it. We have seen that this is very important in the regulation of the flow of water through the kidneys. What, if any, other influence is exerted by the hypothalamus through this channel remains to be discovered. The other channel is purely nervous and consists of connections between the hypothalamus and other parts of the nervous system. Here we need mention only the ascending connections with the cerebral cortex by way of the medial thalamic nuclei<sup>20</sup> and the descending connections with the somatic and visceral centers of the brain stem and spinal cord, and, through the spinal cord, with the sympathetic system. Bronk<sup>21</sup> has shown that the hypothalamus initiates nerve impulses which are discharged through the sympathetic nerves. Since, as we shall see, the hypothalamus is the chief center for the sympathetic system, these visceral connections are of major importance.

While isolated sympathetic responses do occur it is common for the entire sympathetic system to be thrown into action at once. Such generalized visceral activity always occurs during intense emotional excitement. During such excitement the pupils dilate, the hair bristles, the heart beats more rapidly, arterioles constrict causing a rise in blood pressure, the bronchioles dilate, and increased amounts of adrenalin and sugar are thrown into the blood stream. All of these changes are brought about through the sympathetic system and, as Cannon<sup>22</sup> has pointed out, they serve a useful purpose in preparing the body to

respond vigorously to the situation which evoked the emotional excitement. This unified activity of the sympathetic system, which forms such an important part of the reactions of fear and rage, is brought about by the activity of the hypothalamus.

The hypothalamus is the center for the integration of the visceral and somatic components of emotional expression. When it is removed, a fully developed emotional response is no longer possible and when it is stimulated electrically it can be made to call forth a typical rage reaction. This does not mean that rage and fear as conscious emotions are associated with the activity of the hypothalamus alone. No doubt the reverberations of this activity through the thalamus and cerebral cortex are fully as important for conscious emotions. This phase of the subject has been dealt with in detail by Dr. Cannon<sup>23</sup> and need not detain us here. But in order to prevent misunderstanding it is necessary to emphasize at this point the fundamental distinction between emotional expression as a type of reaction and emotional experience as a phase of consciousness. Dealing with animals we can, of course, study only reactions.

Bard<sup>24, 25</sup> was able to show that if all of the brain above the hypothalamus was cut away, the cat thus deprived of its cerebral hemispheres was more irritable than a normal animal and when restrained on an animal board responded to slight stimulation by struggling, clawing, lashing of the tail, a snarling expression, rapid deep respiration and, in addition, signs of wide spread sympathetic activity, erection of hair, sweating, increased blood pressure and heart rate, and sometimes dilatation of the pupils. Since it was reasonable to suppose that the removal of the cerebral cortex had eliminated any possibility of conscious anger, this reaction complex was called sham rage. When Bard removed the hypothalamus along with all of the brain in front of it, sham rage could no longer be elicited. From these results the conclusion was justified that the nervous impulses which evoke the rage reaction have their origin in the hypothalamus.

Cats from which all of the brain above the hypothalamus was removed by Dr Hinsey<sup>26</sup> were left free from restraint. Instead of the sham rage exhibited by Bard's cats they showed alternating periods of activity and repose. After lying quietly for 5 or 10 minutes they would get on their feet and walk restlessly about for a few minutes and then rest again. Restlessness which in these unrestrained animals expended itself in walking vented itself in fits of sham rage in Bard's animals tied to a board.

Confirmation of the conclusions reached by Bard have been obtained by electrical stimulation of the hypothalamus<sup>27, 28, 29, 30, 31</sup>. In cats under ether anesthesia a bipolar needle electrode was inserted into the brain so that the bare tips of the constituent wires were in the hypothalamus and the electrode was then immovably fixed to the skull. After the animal had recovered from the anesthesia and was resting quietly, a faradic stimulus near threshold strength was applied through the buried electrode. At the onset of stimulation the animal became alert, raising its head and opening its eyes, disclosing dilated pupils. The respiration increased in rate and depth and the animal soon began to struggle, clawing, biting and trying to free itself from the hammock in which it was restrained. If the stimulus was continued the hair on the back and tail began to bristle, sweat appeared on the pads of the feet and saliva ran from the mouth. When such an animal was given a barium meal and examined under a fluoroscope it was seen that stimulation of the hypothalamus caused an immediate cessation of gastro-intestinal peristalsis due to inhibition of the gut through the sympathetic system. In all these respects the cats behaved as they would had they been threatened by a barking dog.

The reactions were specifically hypothalamic in origin. Except when very strong stimuli were used, which spread to the hypothalamus, similar reactions could not be elicited from surrounding parts of the brain such as the thalamus, internal capsule, septum, and infundibular stalk.

Sometimes the stimulation caused evacuation of the bladder, a parasympathetic response, but aside from this the only visceral reactions observed were elicited through the intermediation of the sympathetic system. Irrespective of the location of the electrode in the hypothalamus and even when the electrode was in the region of the anterior commissure or near the infundibulum, stimulation never activated the vagus so as to cause an augmentation of peristalsis. No effect upon the gut was obtained until the strength of current was sufficient to stop gastro-intestinal motility.

These observations were made on unanesthetized cats without graphic recording. In another series of experiments, carried out under light nembutal anesthesia, kymographic records were obtained showing the rise in blood pressure, increased intravesical tension and augmentation of respiration which result from hypothalamic stimulation. In both series of experiments the Horsley-Clarke stereotaxic instrument was used to insert the electrode from above downward through the cerebral hemisphere and thalamus to the desired point in the hypothalamus. This instrument is so designed that, when it is anchored to the cat's head and properly oriented with reference to it by clamps on the lower margins of the orbits and plugs in the external auditory meatuses, it is possible to insert an electrode into the brain from above or from behind in such a manner that its tip will be in contact with any chosen nucleus or fiber tract whose coordinates have previously been ascertained in terms of three rectilinear coordinates with reference to a fixed zero point in the interior of the brain.

In cats under light nembutal anesthesia the hypothalamus and surrounding territory were systematically explored by stimulating in orderly succession every cubic millimeter of their substance. A record was kept giving the coordinates of each point stimulated and the nature of the response. The exact location of each point stimulated was later checked by microscopical study of the brain. For

stimulation we used a faradic current slightly above threshold strength. The bipolar electrode was not more than 0.9 mm in diameter, and the bare tips of the enameled wires, of which it was composed, were separated by a short distance (about 0.2 mm) along its long axis.

Stimulation of the hypothalamus causes vasoconstriction with resultant rise in blood pressure, augmentation in rate and depth of respiration, and increased intravesical tension due to contraction of the bladder. It also causes dilatation of the pupils. Vasoconstriction and pupillary dilatation are responses mediated through the sympathetic system. They occur in association with increased rate and depth of respiration during hypothalamic stimulation and also during intense emotional excitement. Contraction of the bladder is a parasympathetic response mediated through the visceral branches of the sacral nerves.

These autonomic and respiratory responses to hypothalamic stimulation have a short latent period. Some seconds after they have made their appearance, the excitation caused by continued hypothalamic stimulation frequently spreads to somatic motor centers causing running movements or even struggling. But it is clear that the rise in blood pressure and increased intravesical tension are not due to the contraction of skeletal muscles, because these autonomic responses appear first and are represented on the kymograph records by smooth curves. Furthermore, they can be obtained just as well in an animal in which contraction of skeletal muscles has been abolished by curara.

These visceral reactions are obtained most readily from the region occupied by the medial forebrain bundle in the lateral part of the hypothalamus, Fig. 4B. They can also be obtained from the gray matter surrounding the fornix and sometimes from the medial edge of the internal capsule, but since they cannot be obtained from these fiber bundles excepting where they border on a line within the hypothalamus, they are not due to stimulation of the fibers contained within these bundles. Qualification of this state

ment is required so far as the medial forebrain bundle is concerned. This fiber tract arises farther forward in the brain and runs backward into the lateral part of the hypothalamus, where it appears probable that it is joined by fibers from the more medially situated hypothalamic nuclei, and the presence within it of these fibers of hypothalamic origin may be the chief reason for the reactivity of the lateral hypothalamic area. It is not possible to be certain about this because at this point anatomical and physiological evidence are in conflict.

The visceral reactions so characteristic for the hypothalamus are not obtained from the overlying thalamus. From the region immediately in front of the hypothalamus, i.e., from the region surrounding the anterior commissure, there are obtained good bladder contractions associated with a decrease in the rate and depth of respiration and sometimes also a fall in blood pressure, Fig 4A. Because of the great regularity with which parasympathetic bladder reactions, uncomplicated by any sympathetic activity, are obtained from the region surrounding the anterior commissure and from the adjacent portion of the septum, it seems probable that nuclear masses concerned in this reaction are located here.

Occasionally we have obtained from stimulating the septum and the region around the anterior commissure a good depressor reaction with a definite slowing of the pulse indicating an inhibition of the heart through the vagus nerve. This is accompanied by an inhibition of respiration.

On the drawings in Fig 4 have been indicated the points which, on stimulation, yielded changes in blood pressure. Triangles represent falls, large black dots, marked rises, and crosses, moderate rises of intraarterial tension. A represents a section through the anterior commissure and optic chiasma, i.e., in a plane just in front of the hypothalamus. At this level drops in blood pressure were frequently obtained from the septum and from the gray matter surrounding the anterior commissure. The grouping of large black dots just above the optic chiasma represents the

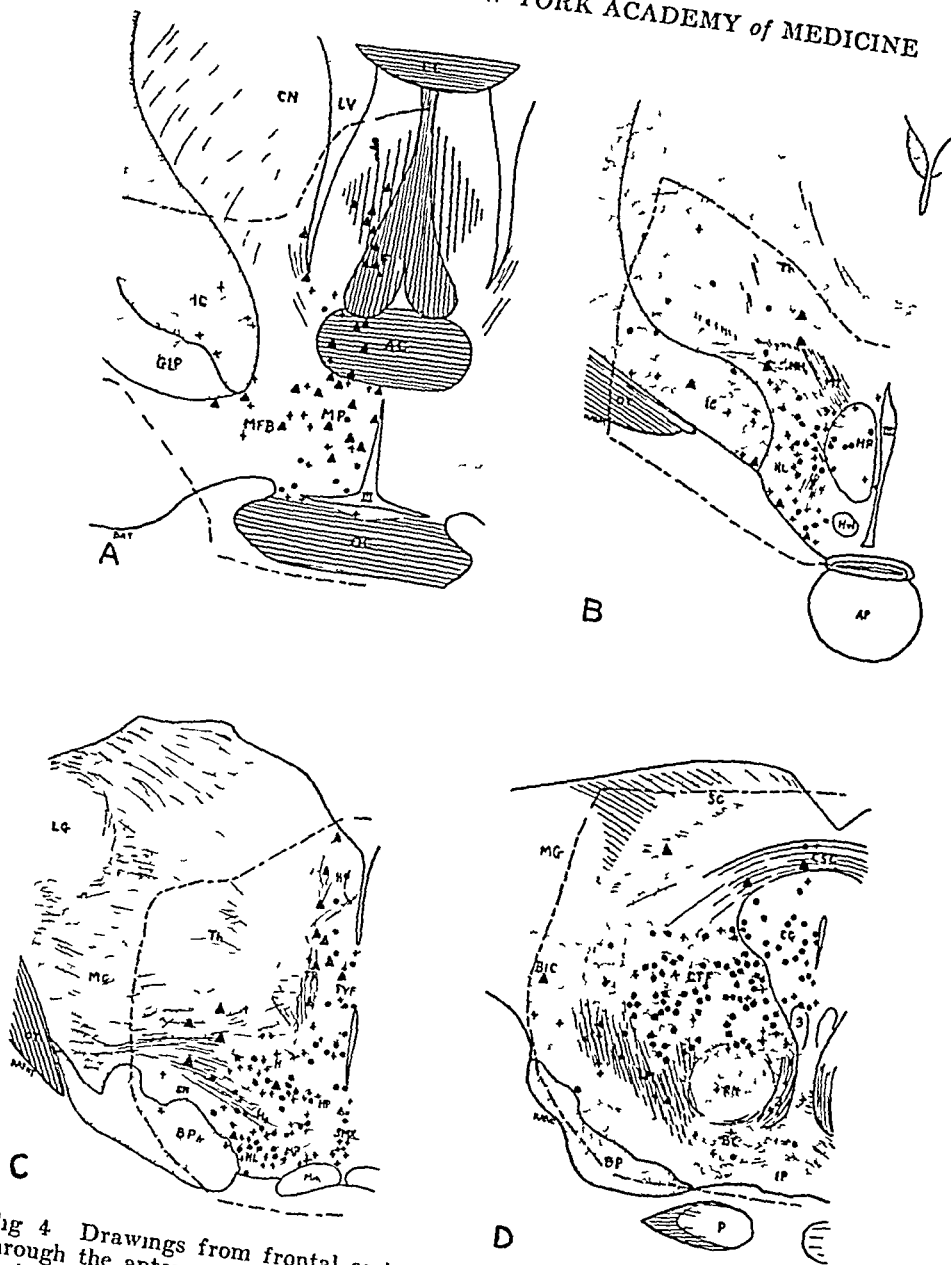


Fig 4 Drawings from frontal sections through the brain of the cat A, through the anterior commissure, B and C, successive levels from before backward through the thalamus and hypothalamus, D, through the mesencephalon AC, anterior commissure, AP, anterior lobe of the pituitary, BP, basis pedunculi, CC, corpus callosum, CN, caudate nucleus, F, fornix, FR, habenulopeduncular tract, GLP, globus pallidus, H1, H2 fields of Forel, H, habenula, HL, lateral hypothalamic area, HP, nucleus hypothalamicus posterior, Hvi, nucleus hypothalamicus ventrolateralis, IC, internal capsule, LG, lateral geniculate body, LV, lateral ventricle, MFB, medial bundle of the forebrain, MG, medial geniculate body, Mm, medial mammillary nucleus, MPo, medial preoptic area, MT, mamillothalamic tract, NHI, nucleus of H1 field of Forel, OC, optic chiasm, OT, optic tract, PVF, periventricular fibers, S, septum pellucidum, SN, substantia nigra, Th, thalamus, and III, third ventricle Reproduced from the Archives of Neurology and Psychiatry

anterior end of the hypothalamic sympathetic center from which marked rises in blood pressure were obtained B and C are successive sections from before backward through the hypothalamus and D through the mesencephalon In each, the large black dots represent points from which marked rises in blood pressure were elicited

On similar charts there have been plotted the points which, upon stimulation, yielded changes in the diameter of the pupils, and those points from which contraction of the bladder was obtained A comparison of these charts suggests that the region just in front of the hypothalamus may perhaps represent a general parasympathetic center This region includes the gray matter around the anterior commissure and near the ventral tip of the lateral ventricle and parts of the septum and preoptic area, Fig 4A Stimulation of this region regularly causes contraction of the bladder, sometimes also a fall in blood pressure, rarely constriction of the pupil, and very rarely indeed slowing of the heart All of these are parasympathetic reactions, but if this is a general parasympathetic center there must be some reason why constriction of the pupil and slowing of the heart are not more frequently obtained Stimulation of this region also causes an inhibition of respiration

The sympathetic center in the hypothalamus yields, on stimulation, augmentation, instead of inhibition, of respiration, and also rises in blood pressure and dilatation of the pupils From the sympathetic center there can be elicited also contraction of the bladder, but this has been interpreted as due to stimulation of fibers, arising in the center for the bladder situated farther forward and running backward through the sympathetic center to reach the spinal cord

Near the caudal end of the hypothalamus the reactive zone includes the posterior hypothalamic nucleus and the gray matter surrounding the third ventricle, Fig 4C Sympathetic reactions are also obtained with great regularity behind the hypothalamus from the mesencephalic tegmentum and the central gray matter surrounding the



cerebral aqueduct, Fig 4D Whether the sympathetic center itself extends from the hypothalamus into the mid-brain or only sends descending fibers down the brain stem, remains to be determined

It has been generally believed that the impulses from the hypothalamus descend through the central gray matter covering the floor of the fourth ventricle To test this assumption a cut was made across the ventricular floor The rise in blood pressure and contraction of the bladder caused by hypothalamic stimulation were approximately the same after as before the section, showing that the pathways from the hypothalamus run elsewhere than through the ventricular floor

In other cats bilateral cuts were made severing the lateral parts of the pons and leaving the floor of the fourth ventricle intact The vasomotor and respiratory reactions caused by hypothalamic stimulation were greatly reduced by such lateral sections This and other evidence indicates that the pathway from the hypothalamus descends through the pons chiefly in the lateral part of the tegmentum <sup>32</sup>

In addition to its effects exerted directly through nerve fibers, stimulation of the hypothalamus results in the formation of the hormones, adrenin and sympathin which become distributed through the body in the blood stream and serve to spread, reinforce and prolong the autonomic excitation It has been possible, by a technique which cannot here be given, to distinguish between these two hormones and to show that following hypothalamic stimulation both are present in the blood in increased amounts <sup>33</sup>

#### SOMNOLENCE

In view of the emotional excitement and the visceral and somatic activity caused by hypothalamic stimulation it is not surprising that emotional stolidity and somnolence are caused by lesions of the hypothalamus The making of bilateral hypothalamic lesions caused a striking change in the behavior of the normally very wild and excitable rhesus monkeys They became drowsy or even somnolent and when awakened were tame and tractable

These monkeys with hypothalamic lesions had a strong grasp reflex and would hang from a rod supporting their weight with their arms. The lesions which were responsible for the somnolence were bilateral and were situated in the lateral part of the hypothalamus some distance from the midline, Fig 5. They partially destroyed the region which, on stimulation, produces the signs of emotional excitement.

Most of these monkeys recovered from the somnolence in a few days but a few remained tame and drowsy for many weeks. In some there was, in addition to the bilaterally placed lesions in the lateral hypothalamus, considerable secondary involvement of the thalamic nuclei. It is quite possible that such thalamic damage may aggravate and prolong the symptoms caused by hypothalamic lesions. But lesions confined to the thalamus have not in our experience caused somnolence. In several monkeys, which were not at all drowsy but instead remained alert and active, large lesions were found on both sides of the thalamus.

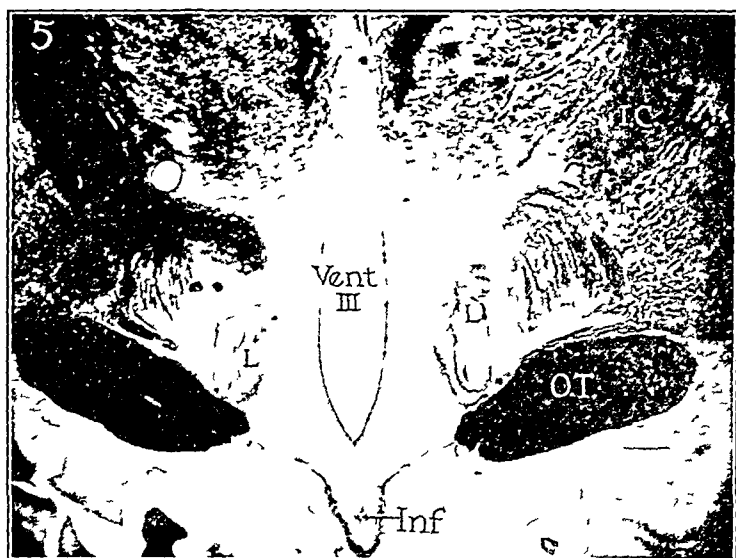


Fig 5 Photomicrograph of a frontal section of the brain of a monkey, showing in the hypothalamus the bilateral lesions (L, L) which caused somnolence. IC, internal capsule, Inf, infundibulum, OT, optic tract, Vent III, third ventricle.

The monkey with the very large thalamic lesions shown in Fig 6 awakened from the anesthetic in the normal manner and thereafter showed no signs of drowsiness but remained alert and active. It was a little less afraid than before the operation but when the door of the cage was opened it would jump around in the rear of the cage, chatter and grimace. Its capacity for emotional expression was not impaired. There was some impairment of the finer movements of the hands but no other motor difficulty. The deficiency in motor initiative, which was such a conspicuous feature in somnolent monkeys, was not seen in monkeys with purely thalamic lesions. The amount of sensory disturbance could not be satisfactorily determined, because it is extremely difficult to make reliable tests of sensory function in wild monkeys.

The somnolent monkeys with hypothalamic lesions could be awakened without difficulty but would go off to

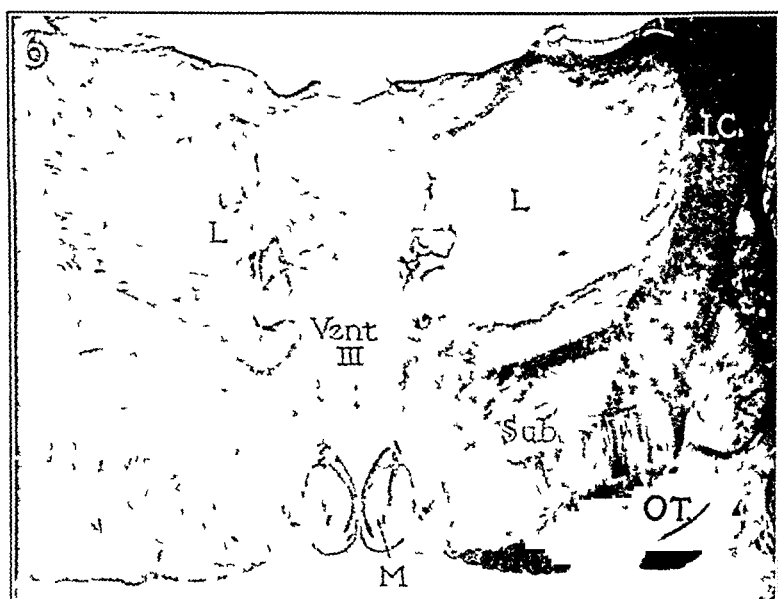


Fig 6 Photomicrograph of a frontal section of the brain of a monkey, showing in the thalamus large bilateral lesions (L, L) which did not cause somnolence. The subthalamus and hypothalamus are intact. IC, internal capsule, M, medial mammillary nucleus, OT, optic tract, Sub, subthalamus, OT, optic tract.

sleep again as soon as they were left undisturbed. They often would fall asleep while eating and with the mouth full of food. When awakened they were emotionally unreactive. During the period of recovery, when the drowsiness had disappeared and they were again alert, they remained free from fear and allowed themselves to be handled and petted. Their faces were blank and free from wrinkles indicating relaxation of the facial muscles. This gave them a sad vacant expression. Their faces failed to register the play of emotions so characteristic of the wild monkey in captivity.

It was found easy to produce somnolence also in cats by lesions in the region of the mammillary bodies and between them and the third nerve<sup>34</sup>. In addition to the pronounced drowsiness these cats showed a peculiar plasticity of the body such that they would maintain odd postures into which they were molded by the experimenter. In this combination of somnolence and plasticity, they resembled patients with the cataleptic type of encephalitis lethargica and as often occurs in these patients, there was not uncommonly an involvement of the oculomotor nerve. We saw a comparable condition of plasticity in only one monkey. Perhaps this can be accounted for by a difference in the location of the lesions in the two series of experiments.

In the cats the lesions involved the caudal end of the hypothalamus and the region of transition between this and the midbrain. The location of the lesions was consistent with the assumption that the somnolence was produced by blocking the passage of impulses backward from the hypothalamus to the brain stem and spinal cord. No damage was done in front of the mammillary bodies. The rostral two thirds or three fourths of the hypothalamus was intact as was also its connection with the cerebral cortex through the medial group of thalamic nuclei. This would indicate that involvement of the connections between the hypothalamus and the cortex by way of the medial nuclei of the thalamus is not essential for the production of somnolence.

In both cat and monkey the medial lemniscus and other sensory pathways to the thalamus and cerebral cortex were intact, and, likewise, the great efferent pathways in the cerebral peduncles. The somnolence was not due to the interruption of connections between the cerebral hemispheres and lower lying centers of the nervous system.

It is certain that the hypothalamus is concerned in some special way with the regulation of the alternating sleep-waking rhythm. Lesions farther forward in the region of the optic chiasma or farther back in the red nuclei or higher up in the thalamus do not cause somnolence. It may seem strange that hypothalamic lesions which do not interrupt any of the great sensory pathways to the cerebral cortex should produce sleep, but the explanation seems to lie in the loss of the emotional drive normally exerted by the hypothalamus.

Somnolence is often seen in patients with tumors involving the hypothalamus.<sup>35 36</sup> Furthermore, in the epidemic form of sleeping sickness, known as encephalitis lethargica, the gray matter beneath the floor of the third ventricle and in the zone of transition between this and the cerebral aqueduct, is extensively involved. Our observations are, therefore, not entirely new. It has been known for years that some part of the brain, situated in this general region, is concerned with the regulation of sleep. From these experiments on monkeys and cats we have obtained more precise information as to the part of the brain involved and have learned that the emotional drive furnished by the hypothalamus is an important factor in maintaining the waking state.

#### TEMPERATURE CONTROL

It is now generally admitted that the hypothalamus serves as a thermostat regulating body temperature<sup>35,37, 38 39 40, 41 42</sup> but previous work has not shown clearly what part of the hypothalamus serves this function. In investigations designed to answer this question and to determine whether or not one and the same mechanism protects the animal against both overheating and excessive cooling,

electrolytic lesions were placed in the hypothalamus of young *Macacus rhesus* monkeys, weighing from three to six pounds, and in adult cats<sup>43 44</sup>

The animals were kept under observation for several weeks. They were free from infection and quite normal except for the disturbance in temperature regulation and other signs of hypothalamic injury such as polyuria, drowsiness and emotional stolidity. This is important because most previous observations have been made on acute preparations or on animals which lived but a few days, and which, because of the gross nature of the brain lesions, were far from normal.

Some of our animals which showed a tendency to run a subnormal temperature were kept for a time in an incubator regulated to run at 84° to 86° F., but others were kept from the start under ordinary room conditions. Rectal temperature readings were made each morning. Tests were made to determine the ability of the animals to react to room temperatures higher and lower than normal. Similar observations were made on normal cats and monkeys to obtain standards for comparison.

Some of the monkeys with hypothalamic lesions showed marked postoperative rises in temperature which returned to normal in a day or two. Those of another group were unable to keep the temperature up to the normal level. The monkeys in this second group were poikilothermic and their temperature rose and fell with that of their surroundings. But, putting aside for the moment the dual nature of the loss in the capacity for heat regulation, it will be convenient to speak of the first group as showing hyperthermia and the second hypothermia. Of the twenty-nine monkeys, eight showed transient postoperative hyperthermia, thirteen showed more or less prolonged hypothermia and eight others showed no significant deviations from the normal when kept in a moderately warm room.

The operations were performed in the morning. During the afternoon the hyperthermic monkeys showed marked postoperative rises in rectal temperature reaching 105 or

106, 4 or 5 degrees above the normal which is 101. In most instances the temperature fell to normal on the second day, but in three not until the third day. These monkeys never ran subnormal temperatures. In sharp contrast to those just described, the monkeys of the hypothermic group lost heat rapidly during the afternoon following the operation and required the application of external heat. They ran a subnormal temperature for many days and remained in surprisingly good health with rectal temperatures ranging from 90 to 95°. They did not shiver.

Monkey 39 may be taken as an example. Two days after the operation the animal was in the incubator and had a rectal temperature of 97.4°. After 1 hour exposure to a room temperature of 77° the rectal temperature fell to 95.8°. On the 10th day the animal had been out of the incubator for 24 hours at a room temperature of 75.2° and the rectal temperature was 93.2°. A day later under similar conditions it had fallen to 88.1°. The animal was put back in the incubator and its temperature rose to 98.1°. Set out again into the room, the animal continued to run a subnormal temperature for about 2 weeks more and then in warm July weather the rectal temperature rose to normal. But this recovery from hypothermia was only very partial because on the 36th day, after one hour exposure to a room temperature of 64.5°, the rectal temperature fell to 94.4°.

These hypothermic monkeys were really poikilothermic. When they were subjected to gradually increasing external temperatures beginning at 84° and increasing during a three-hour period to 102° or 103° the rectal temperature rose steadily reaching 105° or 106°. In none of the operated monkeys was sweating observed. Normal monkeys subjected to the same treatment perspired and their rectal temperature did not rise above 103°.

Microscopic study of the brains revealed a fundamental difference in the location of the lesions in the hypothermic monkeys from those in the hyperthermic ones. Those monkeys which ran subnormal temperatures had lesions

extending far back in the lateral hypothalamic area along the lateral sides of the mammillary nuclei

In sharp contrast to the lesions just described are those found in the monkeys which developed high temperatures on the afternoon of the operation. In this group the lesions were restricted to the anterior part of the hypothalamus. They involved the region above the optic chiasma and extended backward to the level of the infundibulum or a little beyond but did not reach the mammillary region.

Defective regulation against heat was also found in cats with anterior hypothalamic lesions. When normal cats are heated and the rectal temperature is plotted on the ordinate against the rate of respiration on the abscissa it will be seen that the curve rises slowly, indicating that a small rise in rectal temperature is accompanied by a great increase in respiratory rate which may reach three hundred per minute. When cats with anterior hypothalamic lesions are treated in the same way it becomes apparent that rises in rectal temperature up to 105° or higher are associated with relatively little increase in respiratory rate.

Fig 7 shows the location and extent of the lesion in one of these cats. The infundibulum has been destroyed by lesions, which involve the floor of the anterior part of the third ventricle and extend forward over the optic chiasma.

The cat which had the lesions shown in Fig 7 ran a temperature definitely above normal, varying between 103° and 104° during the first four postoperative days. Thereafter, the temperature was normal. On the twelfth day the cat was subjected to a freezing temperature of 32° for three hours and its rectal temperature fell less than half a degree. In spite of the destruction of the anterior part of the hypothalamus there was, therefore, no loss in the capacity to keep the body temperature up to normal level. On the fourteenth day the cat was subjected to an external temperature of 103° and the rectal temperature rose rapidly from 100.6° to 105.3° in one and one-half hours. The cat's temperature had risen to 104° before there was much increase in respiratory rate and panting did not begin until it had reached 105.3°. There was no sweating.



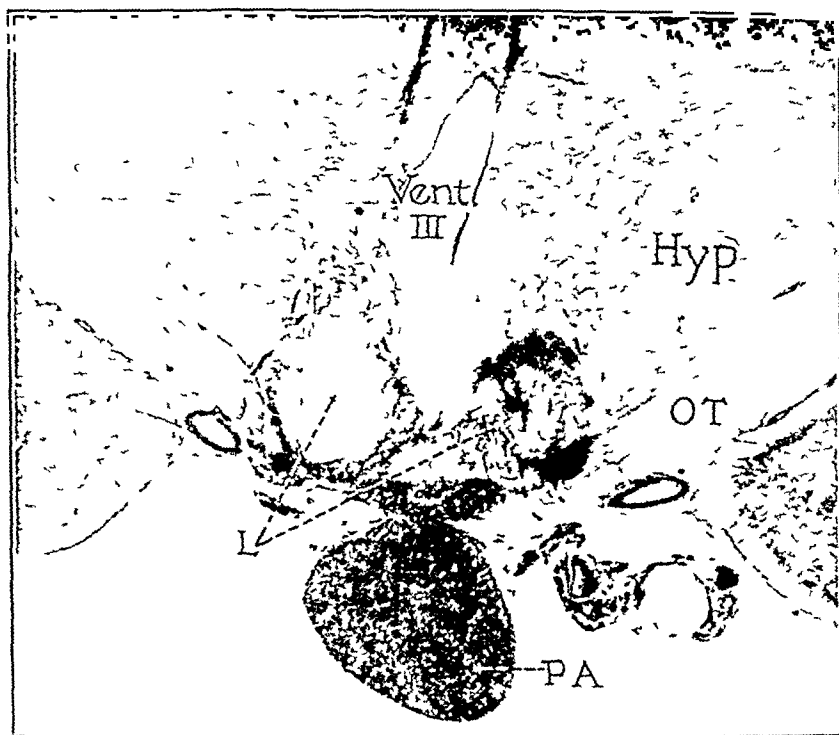


Fig 7 Photomicrograph from a frontal section of the hypothalamus of a cat with defective regulation against heat Hyp, hypothalamus, L, lesions, OT, optic tract, PA, pars anterior of the hypophysis, Vent III, third ventricle

Thirty-two cats with anterior hypothalamic lesions were subjected to this heat test. The average rectal temperature at which panting began was  $105^{\circ}$ . Eight of them failed to pant, although their temperatures were raised to  $106^{\circ}$  or higher. There was no sweating even on the pads of the feet.

Thirty-seven of these operated cats were subjected for three hours to external temperatures near the freezing point. They all shivered like normal cats. Twenty-six of them maintained their body temperatures above  $100^{\circ}$  and in only 4 did it fall below  $98^{\circ}$ . In the cats which failed to keep the body temperature quite up to normal the lesions were found to have extended farther back than usual involving the posterior hypothalamic nucleus and in some cases also the rostral part of the mammillary bodies.

These experiments on cats and monkeys confirm the now quite generally accepted view that the hypothalamus is concerned with the regulation of body temperature. Furthermore, evidence has been obtained which indicates that the anterior part of the hypothalamus, above the optic chiasma and infundibulum, is concerned with preventing abnormal rises in body temperatures and that the posterior part is concerned in preventing the body from becoming too cold.

After anterior lesions the animals often show transient postoperative hyperthermia and are unable to protect themselves against rising external temperatures but are practically normal in their reaction against cold.

After posterior lesions the animals run subnormal temperatures and are easily chilled. The data so far available seems to indicate that these animals are also unable to protect themselves against heating. They seem to be poikilothermous. Perhaps this can be explained by assuming that the descending pathway from the anterior hypothalamus, concerned with protection against overheating, is destroyed along with the mechanism which protects against cooling when the posterior part of the hypothalamus is destroyed.

#### SUMMARY

In conclusion it may be said that the hypothalamus exerts its important regulatory functions through two channels. By way of the hypothalamico hypophyseal tract it controls the rate of elimination of water through the kidneys. The interruption of this tract results in the atrophy of the pars nervosa of the hypophysis and causes diabetes insipidus.

Secondly, through its connections with the rest of the brain and the spinal cord it is able to activate the sympathetic system and also, though less directly, somatic motor centers. When released from cortical control, as in Bard's preparations, or when stimulated electrically in the normal animal, the hyperactivity of the hypothalamus causes dilatation of the pupils, bristling of the hair, elevation of

the blood pressure, and on the somatic side rapid respiration, struggling, clawing and biting—in other words, the complete picture of emotional excitement. Conversely, damage to the hypothalamus produces emotional stolidity and even somnolence.

Working at least in large part through the sympathetic system, the hypothalamus serves also as a thermostat regulating body temperature.

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# THE INVESTIGATION OF INTERMEDIARY METABOLISM WITH THE AID OF HEAVY HYDROGEN

Harvey Lecture, January 21, 1937

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One of the characteristics of animal life is the assimilation of food-stuffs. As the qualitative and quantitative composition of an ingested food is never the same as that of the body of the animal which consumes it, food is never deposited unchanged. Most of the split-products of the food, after their absorption, are subject to far-reaching chemical changes. Part of the compounds may be burned immediately for energy requirements but another and larger part is deposited in the organism for short or long periods. The final destruction of the carbon skeleton may occur soon, in the post-absorptive period, or much later if the compound is used as a cell constituent. In both cases, however, absorption is followed by chemical conversions.

The investigation of these processes is attended with great difficulties. The ability to interconvert metabolites is such that all constituents of the animal body, except the vitamins and a few essential dietary components, can be formed from other substances. These processes are usually very rapid and, as animals have available an abundant number of different chemical compounds, it is in many cases almost impossible to assign a definite source to a particular substance.

In the field of amino acid metabolism Krebs, by using the method of surviving tissue slices, has recently obtained unexpected and important results. There exists, however, almost no method of carrying out studies on the interconversions of physiological substances in the living healthy and intact animal unless the end-products of such processes are disposed of in the excreta.

In this paper I propose to discuss experiments in which these difficulties have been circumvented by labeling the substances to be investigated by a tag which renders them recognizable in the animal body. All of the experiments which I shall discuss were carried out in collaboration with Dr. David Rittenberg.

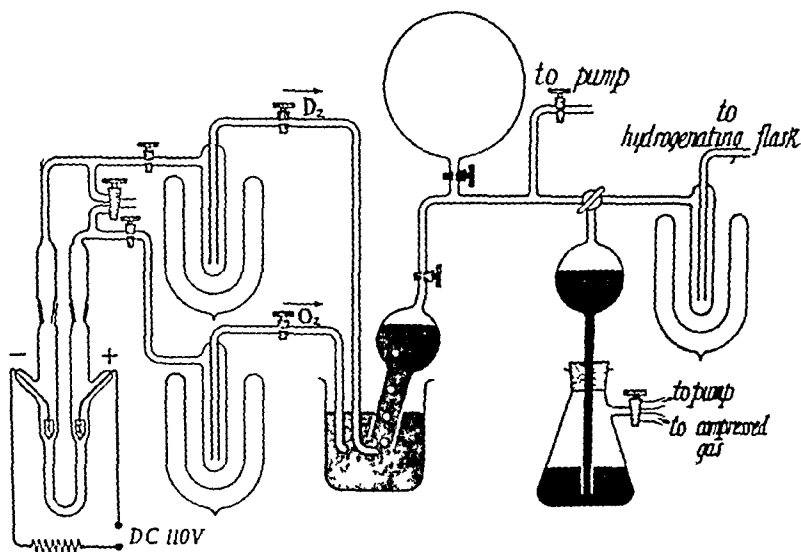
Several attempts have been made before to use such methods for the investigation of fat transport in the animal body. One such type of experiment was to introduce bromine or other halogens into the fatty acid molecule. Thus, in working with stearic acid, animals were given a stearic acid in which one or more of the hydrogen atoms were replaced by bromine. Determination of the bromine should indicate the route taken by stearic acid in the animal. The physical and chemical properties of these halogenated fatty acids, however, are so different from those of their natural analogues that we cannot expect the cell and the organism to treat them alike. In point of fact, these artificial substances are unphysiological and are in some respects treated as foreign bodies.

In order successfully to label a compound for physiological purposes the label has to be such that its introduction does not alter the chemical and physical properties of the substance, so that the cell is unable to detect the change. The chemist, however, has to be able not only to detect the label but to analyze for it in small amounts and in high dilutions.

The only possible labels which would fulfill these requirements are the isotopes of the elements of organic substances, namely, the isotopes of carbon or hydrogen. Isotopes of the same element have identical chemical properties and even so sensitive a chemical selector as the living cell cannot distinguish between them. The only isotope which is available in amounts large enough to be used for physiological purposes is deuterium, the heavy isotope of hydrogen, discovered and isolated by Urey<sup>1</sup>. This heavy hydrogen has an atomic weight of two in contrast to the atomic weight, one, of normal hydrogen.

two atoms of deuterium, one at the  $\alpha$  and one at the  $\beta$  position. As butyric acid contains eight hydrogen atoms these two deuterium atoms represent twenty-five atom per cent of the total hydrogen and on combustion the butyric acid will yield twenty-five per cent heavy water. The expression "atom per cent" will frequently occur in this paper.

Permit me briefly to describe the methods employed.<sup>7</sup> For the hydrogenating process the gaseous deuterium is produced by electrolytic decomposition of heavy water. This has been generously supplied by Professor Harold C. Urey, to whom Dr. Rittenberg and I are also deeply indebted for his interest and advice.



*Hydrogenation with Deuterium*

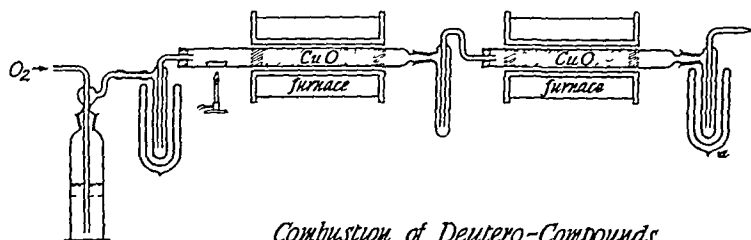
Figure 1

The heavy water is decomposed in the electrolytic cell (Fig. 1), deuterium and oxygen are passed through traps chilled to  $-80^{\circ}$  in order to freeze out entrained water vapor. The oxygen bubbles through mercury into the air, while the deuterium is collected in a 5-liter flask *e*. The gas can be discharged by a Toepler pump into an evacuated hydrogenating flask, not shown in the figure, containing the

substance to be hydrogenated, together with the catalyst. The manometer indicates how much gas is present in the system at any time and how much is used up in the process.

Many pure substances, fatty acids, cholesterol derivatives, bile acids, have already been prepared by this method. As stated before, the substances are indistinguishable from their natural analogues by ordinary laboratory methods. With a few specific exceptions, which cannot here be discussed, these substances can be heated, recrystallized, or treated with acids or alkalis without any loss of deuterium.

The second method which is applied in physiological work with deuterium compounds is the analysis for deuterium in the compounds themselves or in the substances isolated from the animal after their administration. If an organic substance is burned in the laboratory the carbon forms carbon dioxide and the hydrogen forms water. If the substance contains deuterium, the deuterium will form an equivalent amount of heavy water. The deuterium analysis of organic compounds resolves itself, therefore, into the determination of heavy water in the water obtained by combustion. The combustion is carried out by a procedure similar to that used for quantitative carbon and hydrogen determinations (Fig 2). The vapors are carried



*Combustion of Deutero-Compounds*

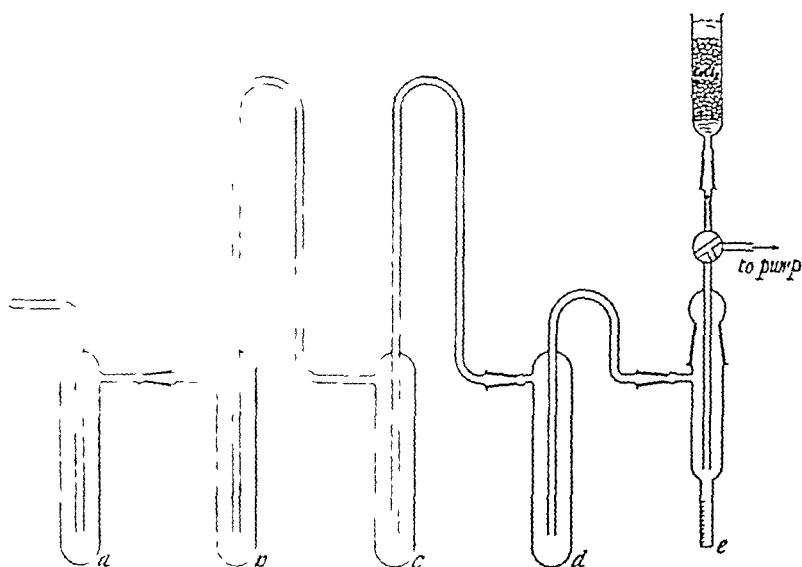
Figure 2

through two tubes filled with copper oxide and heated to  $750^\circ$ . The water obtained is not absorbed by a hygroscopic salt but is frozen out in traps cooled to  $-80^\circ$ . Sufficient



substance is burned to obtain 100-300 mg of water. In the case of fats or sterols this is obtained from about the same weight of organic material.

One of the most difficult parts of the procedure is the purification of the water. That frozen out in the last trap is never pure enough for the deuterium analysis. It is necessary to distil it four times, the procedure being carried out in a closed system of a battery of five traps (Fig. 3). A minute quantity of dry chromium trioxide is



*Purification of Water*

Figure 3

added to the water, one arm of the trap is sealed and the other arm connected with the battery. After heating and then freezing the ice is sublimed in vacuo into the next trap containing a minute amount of dry alkaline permanganate. The water is then sublimed from one trap to another until it is finally collected in the last trap. In general, the water is now pure but to make sure, it is always necessary to repeat the whole procedure and to ascertain that the properties of the water have not changed.

The few drops of water thus obtained are used for the isotope analysis by measurement of refractive index or density according to methods which have been worked out by physical chemists and have been only slightly modified for our special purposes. All of these methods involve a comparison between the properties of the water being analyzed and those of ordinary water, which contains about one fiftieth of one per cent deuterium. All the values given for deuterium represent, therefore, the deuterium content in excess of that of ordinary water.

The methods for heavy water determination are highly sensitive. By density measurements it is possible to determine less than 0.001 per cent heavy water. Since the physiological experiments are carried out with substances containing 1 to 10 atom per cent deuterium, which means that they form a water with 1 to 10 per cent heavy water, the substances may be diluted in the animal 1000 times or even more without our losing track of them.

On account of this high sensitivity it is possible to use the smallest laboratory mammals, namely, mice for physiological experiments with the precious substances.

Although a number of experiments on the metabolism of cholesterol<sup>8</sup> and bile acids<sup>9</sup> have already been carried out, in this paper I shall confine myself to experiments on the fate of fatty acids in the living organism. Dr. Rittenberg and I owe much to the valuable assistance of Mr. Morris Graff in the course of the physiological and chemical experiments.

The first problem undertaken was an attempt to answer the question whether fats are burned immediately after absorption, or first stored.<sup>10</sup> A fat prepared by partial hydrogenation of linseed oil with deuterium was administered to mice. By hydrogenating half of the double bonds so that the product contained 5.7 atom per cent deuterium, an oil was obtained the properties of which were very similar to those of olive oil. Of the many experiments which were carried out I mention only one series which may be regarded as typical. The total fat of the diet of three

mice amounted to only one per cent, consisting almost exclusively of this deutero compound. This is physiologically a very small amount. Furthermore, the total food was so restricted that the animals lost weight from undernourishment. Under these conditions it was, on the basis of our former ideas, to be expected that the animals would burn all the fat immediately after consumption. But this was not the case. At the end of a four day period the animals were killed, the fat of the fat tissues was isolated and the deuterium content of the fatty acids determined (Table I).

FEEDING THREE MICE A DIET CONTAINING  
1% DEUTERO-FAT (5.74 ATOM % D)  
(Duration of experiment four days)

Deutero fat consumed	Deutero fat recovered in fat tissue	Per cent of diet fat stored in fat tissue	Burned diet fat recovered as heavy water
251 mg	119 mg	47%	20%

Table I

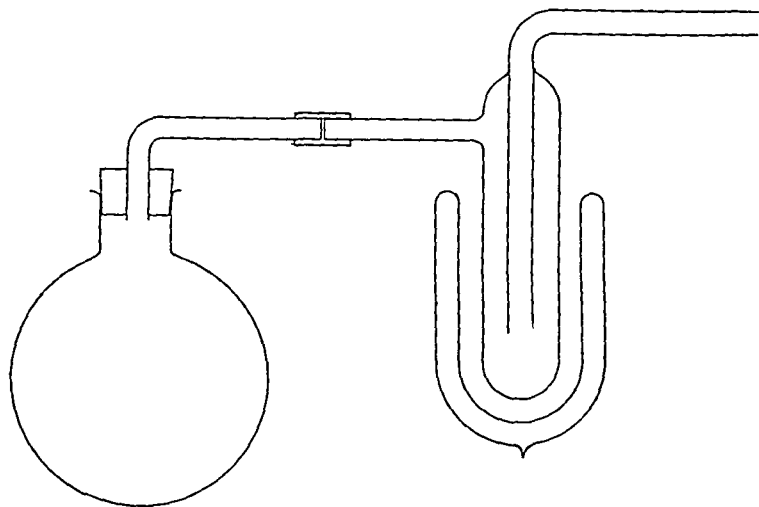
The animals had consumed in the experimental period 251 mg of diet fat. Of this fat there was recovered from the fat depots an amount of deuterium corresponding to 119 mg or forty seven per cent of the diet fat, an unexpectedly high percentage.

From these and many analogous experiments the conclusion was inescapable that the larger part of the dietary fat, even when given in small amounts together with other foodstuffs, is first deposited in the fat tissues and is not oxidized directly. I shall discuss later the physiological implications of this finding.

Of the fat given to the animals about half, namely forty-seven per cent, was recovered. The other part had obviously been burned in the animal. The use of deuterium as a label also furnishes a means for determining the rate and the amount of degeneration in the organism.

As I have stated, deuterium containing substances when burned in the laboratory form an equivalent amount of heavy water. Heavy water is also formed when the combustion takes place in the animal. It will mix with the

body fluids and, as no organ can concentrate or dilute it, the water of all body fluids will have the same composition. In order to measure the deuterium in the fluids any water from the animal may be used. In work with mice the total carcass before chemical treatment is put into a flask connected with a trap cooled to  $-80^{\circ}$  (Fig 4). The system is



*Distillation of Body Fluids*

Figure 4

evacuated, whereby the animal freezes and the water sublimates into the trap. This water after purification is subjected to deuterium analysis. This procedure is carried out in almost all experiments in order to determine the extent of degradation of the deuterio substances fed.

In the series which I have just mentioned the water of the body fluids contained an amount of deuterium equivalent to twenty per cent of the ingested fat. About fifty per cent of the deuterium consumed with the fatty acids was recovered in the fat tissues and twenty per cent in the water. The remaining thirty per cent of the deuterium was probably excreted as water in the urine, feces and breath. We have not yet attempted to run a total water balance which

would be necessary to follow quantitatively the combustion of deuterium containing substances

The experiments leave unanswered the question whether the fatty acids in the fat tissues, which are derived from the diet, are still the same unaltered chemical individuals administered with the food. Various foods may change the properties of the depot fat somewhat but only to a limited extent. Animals have a tendency to form, independent of the quality of the food, a depot fat the properties of which are characteristic for the animal species and depend upon the quantitative distribution of the component fatty acids. An animal given fat in its food may have two theoretically possible mechanisms at its disposal for producing from the dietary fat its own characteristic depot fat. It may either transform the ingested fatty acids or it may synthesize from other compounds just those fatty acids needed to confer upon the depot fat its characteristic properties. Both hypothetical mechanisms, namely, the interconversion of fatty acids and their new formation from other sources, must be investigated to obtain an insight into the fate of fats after their absorption.

The natural fatty acids are usually classified into saturated and unsaturated acids, dependent upon the occurrence of double bonds. This classification is interesting from the standpoint of both chemistry and physiology. The saturated acids, the most important of which are stearic and palmitic acids, are high melting substances and their presence in combination with glycerol gives the fats a solid consistency. The unsaturated acids, for example oleic acid, are fluids at room and body temperatures and render the fats oily. All natural fats contain varying amounts of both classes of fatty acids.

A mechanism whereby the degree of saturation could be varied would enable the animal to give the tissue fat any necessary consistency. For about seventy years physiological literature has contained discussions of the possibility of the biological desaturation of fatty acids, an example of which would be the biological formation of oleic

acid from stearic acid. Although no definite proof for this biological conversion has yet been given, the majority of investigators believe in its occurrence and a number of them postulate it to be the first step in biological fatty acid degradation. Acceptance of this view, however, is far from general, for instance, Drummond,<sup>11</sup> in his Harvey lecture of 1933, after critically surveying the known material, definitely questioned the occurrence of such a process in the animal.

The investigation of conversions of organic compounds in the animal organism can conveniently be carried out with the aid of deuterium. If a deuterio substance, A, is given to the animal and another substance, B, also containing deuterium is isolated from the animal body, B must have been derived from A. For such investigations it is necessary to give the animal a pure chemical compound rather than an undefined fat mixture, such as the oil which was used in the first experiments on fat transport.

To investigate the desaturation of fatty acids,<sup>12</sup> several series of mice were fed the saturated fatty acid, stearic acid, which was obtained by hydrogenation of linoleic acid with deuterium. This stearic acid contained about eight atom per cent deuterium. In the one series which I shall here discuss three animals were fed for twelve days with a diet containing ten per cent of this deuterio stearic acid. At the end of the procedure the animals were killed and the total fatty acids of the carcass were isolated (Table II).

ISOLATION OF UNSATURATED FATTY ACIDS FROM MICE  
FED SATURATED ACIDS (8.66 ATOM % D)

	Deuterium content
Total fatty acids	1.70 atom % D
Saturated acids	2.58 " " "
Unsaturated acids (oleic acid)	1.16 " " "

Table II

The total acids, which contained 1.7 atom per cent deuterium, were fractionated by a procedure especially developed for this problem. The saturated fatty acids contained 2.58 atom per cent deuterium, the high deuterium content of this fraction is obviously due to storage of the saturated fatty acids ingested. The unsaturated fatty acids which, according to the iodine number, consisted mainly of oleic acid, had 1.16 atom per cent deuterium, conclusive evidence of their origin from the administered deuterio stearic acid. This experiment clearly proves the ability of mammals to desaturate fatty acids.

From these findings the question arose as to whether the mice were also able to perform the reverse chemical reaction, namely, the saturation of unsaturated acids. For such experiments mice had to be fed a deuterium containing analogue of oleic acid or other natural unsaturated acid. While it was easy to prepare deuterio stearic acid in the laboratory, we were unsuccessful in synthesizing deuterio oleic acid. All attempts yielded mixtures which contained several isomers of oleic acid and we did not wish to feed these since they are not physiological substances.

If synthesis of a deuterio compound does not succeed in the laboratory it is in many cases possible to obtain it by biological preparation. I have just reported the isolation of a deuterium containing oleic acid formed by mice from deuterio-stearic acid. This oleic acid contained over one atom per cent deuterium, a concentration large enough for feeding experiments. The material was fed to other mice, from which in turn the total fatty acids were isolated and fractionated (Table III). The saturated fatty acids con-

SATURATION OF FATTY ACIDS

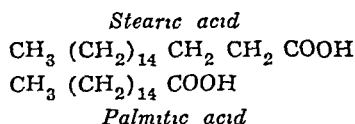
Experiment number	Atom % D in unsaturated acids	Atom % D in saturated acids
1	0.25	0.047
2	0.10	0.025

Table III

tained an amount of deuterium clearly indicative of their origin from the unsaturated acids consumed, in spite of the fact that the deuterium present in the original stearic acid was highly diluted by the two animal passages. These saturated, deuterium containing fatty acids had an interesting history. They were first prepared in the laboratory in the form of stearic acid, desaturated by one group of mice to oleic acid and in turn saturated by another group of mice.

These experiments show that saturation and desaturation is a biologically reversible process, the animal is able to convert only fatty acids into high melting ones and vice versa, and, by the same token, to convert food fats into body fats of any consistency.

The fatty acids may undergo other conversion processes besides saturation and desaturation. The saturated high melting fatty acids of the mammalian fats are mainly mixtures of two acids of very similar properties, namely, stearic and palmitic acids, containing eighteen and sixteen



carbon atoms respectively. The question arises whether the organism is able to convert stearic into palmitic acid, a reaction which involves shortening of the chain by two carbon atoms. The pioneer work on  $\beta$  oxidation by Knoop and by Dakin suggests that such a reaction may take place. However, no methods have been available for investigating this particular process and, to the best of our knowledge, no such study has ever been attempted.

The procedure here followed was in principle the same as that of the experiments just described. Mice were fed pure deuterio stearic acid and from their carcasses the mixtures of saturated acids were isolated. The acids were converted into the methyl esters and the palmitic and stearic acid esters were separated by repeated fractional



distillation (Table IV) The deuterium content of the isolated palmitic acid proved definitely its origin from the stearic acid administered

DEUTERIUM CONTENT OF FATTY ACIDS OF MICE AFTER  
FEEDING DEUTERO-STEARIC ACID (7.13 ATOM % D)

Stearic acid	Palmitic acid
2.6 atom % D	0.33 atom % D

Table IV

All these experiments on conversion of fatty acids substantiate the aforementioned hypothesis that the dietary fatty acids may be converted into other acids necessary to give the depot fats such properties as are characteristic of the species. These interconversions, however, represent only one chapter in the formation of depot fat. Another even more complex one is the synthesis of fatty acids from food materials other than fats. The occurrence of such animal synthesis from sugars has long been established in the case of overfeeding and plays a rôle in the fattening of animals with carbohydrates.

Synthesis of fats has previously been measured only by indirect methods, such as balance experiments, and was recognized only when the animals put on more fat than was administered with the diet.

Deuterium represents a tool that can also be employed generally for the study of synthetic processes in the animal body. If an organic substance is synthesized in the laboratory in a medium of heavy water instead of ordinary water, the deuterium of the heavy water may enter the reaction and be found in the product synthesized. This is a principle which is frequently used for the preparation of deuterio substances in the laboratory.

If the body fluids of an animal contain heavy water, synthetic processes in the animal will, just as in the laboratory, lead to products containing deuterium. Heavy water may thus be used as a general indicator for synthetic processes in animals.

For experiments of this kind<sup>13</sup> mice were first injected with an amount of concentrated heavy water just sufficient to raise the heavy water content of the body fluids to a concentration of 1.5 per cent. In order to maintain the body fluids of the mice at this heavy water concentration, the mice were given 2.4 per cent heavy water to drink instead of ordinary water. This was found in preliminary experiments to be the proper concentration for keeping the body fluids at 1.5 per cent. The drinking water has of course to have a higher concentration as it will be diluted in the animal by the ordinary water formed by the combustion of food material. So from the moment of heavy water injection all synthetic processes in the mice took place in a medium of about 1.5 per cent heavy water. In the experiments now to be reported the mice received a basic diet of bread, which was practically devoid of fat (Table V).

DEUTERIUM CONTENT IN BODY FLUIDS AND FATTY  
ACIDS OF MICE GIVEN HEAVY WATER

Experiment number	Duration of experiment days	Deuterium in body fluids atom per cent	Deuterium in fatty acids atom per cent
1	3	1.21	0.11
2	4	1.09	0.08
3	6	1.43	0.21
4	9	1.50	0.20
5	19	1.51	0.22

Table V

Five series of three mice were killed at different intervals and water and fats were isolated from the carcasses and analyzed for deuterium. While in the first days of the experiments the heavy water concentration in the body fluids varied somewhat, it was constant after six days. The deuterium content of the fatty acids rose rapidly and attained a maximum after about six days and continuation of the experiments up to even nineteen days brought about no increase over the concentration at six days.

If the uptake of deuterium into the fatty acids indicates a new synthesis of fatty acids, the experiment means that

the fatty acids of mice on a carbohydrate diet are replaced after six days by new fatty acids which are now characterized by a content of 0.21 atom per cent deuterium. As the animals did not gain or lose weight and therefore must have kept their total amount of fat constant, there must have occurred with the synthesis a simultaneous breakdown of an equivalent amount of fatty acids.

In order to demonstrate this breakdown the reverse experiment was carried out instead of giving mice heavy water to drink, eight groups of three mice each received deuterium-containing fatty acids and bread, together with ordinary water. The deuterio-fatty acids were partly stored in the fat depots as was pointed out in all the former experiments. Thus, the fat depots were labelled by deuterium. After five days of this diet the five control groups had an average deuterium content of 0.93 atom per cent deuterium in their depot fats (Table VI). The remaining

DEUTERIUM CONTENT OF FATTY ACIDS OF MICE AFTER DISCONTINUATION OF FAT FEEDING

Expt no	Days on fat free diet	Combined wt of animals gm	D <sub>2</sub> in fatty acids Atom %
1		57	0.97
2		59	0.90
3		59	0.72
4		57	1.05
5		65	1.02
		Average	0.93
6	2	56	0.66
7	4	57	0.35
8	6	65	0.13

Table VI

three groups of mice were now continued on the same diet without the fat, that is, on bread and ordinary water. The deuterium content of the depot fat of these animals now decreased rapidly and after six days on the bread diet only about 15 per cent of the original deuterium remained. A rapid destruction of the fatty acids had thus occurred.

If the results of the last two experiments are plotted together, the first experiment in terms of fatty acid synthesis and the second in terms of fatty acid destruction, both curves run almost parallel (Fig 5), indicating that in

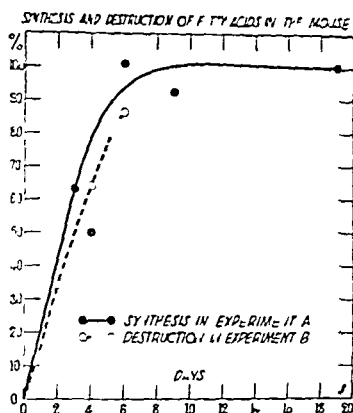


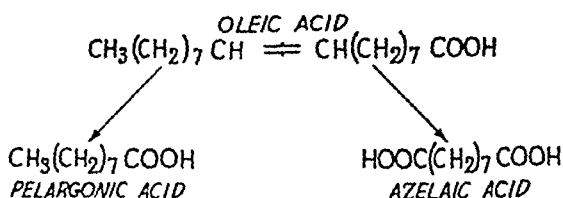
Figure 5

both experiments we had measured the same process, namely, the turnover of fatty acids in mice on a carbohydrate diet. According to the findings, mice on a bread diet continuously form and destroy fatty acids, and after about six days new fatty acids have replaced the old ones. The average half lifetime, under the above conditions, of the fatty acids in the mouse is less than three days.

The methods were so new and the results so unexpected that a number of other experiments had to be performed to make sure that what had been measured was actually a turnover of fatty acids and not some other process which might have brought about the same results. One such possibility was the following: saturation and desaturation of fatty acids is, as above stated, a biologically reversible process. This process may go on in the organism continuously. If the double bonds of unsaturated acids are saturated in a medium containing heavy water, deuterium must enter into the molecule. If this process takes place in an animal the body fluids of which contain heavy water, as in the

first experiment, the saturated acid may also acquire deuterium. Conversely, a deuterium-containing fatty acid when desaturated may lose deuterium, as in the second experiment. The question arose whether the findings might not just as well have been the result of repeated saturation and desaturation rather than of a turnover of the fatty acids.

That saturation and desaturation were not responsible for our results could be proved by investigating the chemistry of the newly formed fatty acids. All the unsaturated fatty acids of the mammalian organism which contain sixteen and eighteen carbon atoms have one double bond between  $C_9$  and  $C_{10}$ . In the acids with more double bonds, such as linoleic and linolenic acids, the other double bonds are situated in the part of the chain remote from the carboxyl group. The part of the molecule between the carboxyl group and  $C_9$  is always saturated and never contains double bonds. Therefore, all the unsaturated acids, like oleic acid, form azelaic acid on oxidation. If the part of the fatty acid



molecule represented by the azelaic acid contains deuterium, the latter could not have entered the molecule by a process of hydrogenation but must have entered by another mechanism. From the deuterium-containing fatty acids which were formed by the mice which drank heavy water, the unsaturated fatty acids were isolated, ozonized, and subsequently oxidized. The azelaic acid obtained in pure form contained the same percentage of deuterium as the total fatty acid from which it was split off. This deuterium could not have entered by saturation of double bonds since this part of the molecule, as already stated, never contains a double bond. Hydrogenation and dehydrogenation could,

therefore, not have been responsible for the results of these two experiments

There still existed one other possibility that may have been responsible for the findings. The deuterium containing substances which were fed to the animals and those which were isolated from the bodies, all had their deuterium in stable linkage. Such substances can be heated to high temperatures, treated with strong acids or alkalis, etc., without any loss of their deuterium, and their stability in the organism was to be expected. But if there existed in the body an enzyme which labilizes carbon bound hydrogen so that the deuterium may exchange with the hydrogen of the solvent, in our case the body fluids, such an enzymatic exchange might have led to similar results. As nothing was yet known about such enzymes, experiments had to be carried out to exclude their occurrence.

The most convenient procedure for such investigation is to keep living organs in contact with heavy water and to determine whether deuterium enters organic molecules in stable positions. Mammals are not suitable for such studies. They have to be fed, and if their body fluids contain heavy water the conversion of food into other constituents will in itself lead to the uptake of deuterium. A suitable organism must not ingest food but must have an active metabolism and live for a considerable time. The developing hen's egg was used for this purpose.

Fertilized eggs were injected at the first day of development with an amount of heavy water sufficient to bring the concentration of heavy water up to one per cent, a level which persisted to the end of the experiment. The eggs were then incubated, after twenty days, immediately before hatching, the chicks were removed and the fatty acids isolated. If a labilizing enzyme were present in the eggs, the fatty acids should contain deuterium, introduced by exchange with the deuterium of the cell water. But the fatty acids of the chicks contained not a trace of deuterium above the normal level.

These facts exclude with certainty the presence in eggs of an enzyme which labilizes carbon-bound hydrogen in fatty acids. And as in general the enzymes of chicks are the same as in mammals, we feel justified in excluding its presence also in mice. The finding furthermore establishes the interesting fact that no turnover of fatty acids takes place in developing eggs. The egg utilizes the fatty acids already present but no new fatty acids are formed. It was later found that the same is true of the cholesterol, which is not only not synthesized but also not destroyed by the developing egg.

The chicks which developed in dilute heavy water were indistinguishable from the normal control animals. This finding is of interest in connection with the theory postulated by several investigators that even small concentrations of heavy water have a marked influence on the total metabolism of the cell. If this were the case a difference should have been noticeable. In general, while it seems certain that high concentrations, namely, over thirty per cent, influence the rate of physiological reactions, none of our numerous experiments with heavy water in low concentrations gave the slightest indication of any effect.

All five experiments together show that in mice on a carbohydrate diet the fatty acids have a surprisingly rapid turnover. They are continuously decomposed and resynthesized, and under our conditions this process was completed within about six days.

The question arises as to the source of the newly formed fatty acids. Our animals received mainly carbohydrates and only a minimum of protein. The large amounts of fatty acids which were synthesized must have been derived from the carbohydrates of the food.

As already mentioned, it has been known for a long time that carbohydrates may be converted into fats by higher animals under the condition of overfeeding or fattening. The new experiments show that this conversion occurs not only under these extreme conditions but also on a normal diet.

We are certain that this process takes place not only in mice but occurs in all animals. However, we do not wish to suggest that the turnover always occurs within six days. It must depend upon the species of animal and the conditions under which the animals are kept. It is probably faster in small animals, which have a more rapid metabolism than larger ones.

The only explanation which we can offer for this turnover is the following. Animals do not eat continuously but at intervals. At each meal the animal has to consume an excess of food for utilization during the post absorptive period. Part of the excess carbohydrates and amino acids is deposited in the organs in the form of glycogen, but the capacity for glycogen deposition, especially in small animals, is strictly limited. The larger part of the excess carbohydrate is immediately converted into fats and stored in the fat tissues. During the post absorptive period, after the glycogen has been consumed, energy is supplied by the oxidation of fatty acids liberated from the depots.

The fat tissues are generally regarded as a storage for time of need and have frequently been compared with a dead storage or food cellar for emergencies. On the basis of the new findings the fat tissues might better be compared with the refrigerator in which excess food is stored for the short periods between meals. If a less homely comparison be desired, the fat depots may be regarded as a biological energy buffer. During absorption they take up in the form of fats excess food material not immediately used for energy requirements. Conversely, during the post-absorptive period they supply fats to make up the energy deficit.

Contrary to the general idea of the slow metabolism of fat tissues, all the experiments above outlined point to the fact that the fat stores are very actively involved in the conversion processes characteristic of life. It would be highly interesting to know whether there exist any diseases in which one or the other of the reactions mentioned is disturbed. Investigations along such lines may throw light on some diseases of fat metabolism.



Deuterium has given us an insight into the far-reaching changes undergone by fatty acids in animals under normal dietary conditions. The various acids are continually interconverted into one another, are degraded and replaced by new acids, without necessarily any change in the total fat content of the animal. Analogous measurements on cholesterol in mice have shown that this complex organic molecule is subject to almost the same process as the fatty acids, that is, to a continuous degradation and synthesis. It can already be predicted with a high degree of probability that the same will be found true of many if not all of the other organic constituents of the animal body.

It has long been recognized that the morphological units of the living tissue, namely, the cells, have also a brief life time. They are continuously being replaced by new and identical cells, while the tissue as a whole maintains, with limited variations, its characteristic structure. In analogy to this, there is a similar continuous destruction and replacement of the various organic chemical molecules in the living animal. What is especially striking is that this occurs even with those substances which had previously been assumed to serve only as reserve material and not to be actively involved in the general metabolism.

To preserve the structure of a tissue at a given moment it is necessary to interrupt the cellular replacement process by removing the tissue and to fix it by the usual histological technique. Attempts to preserve the chemical constituents at a given instant must follow analogous lines. The chemical substances when isolated from an organism may be kept unchanged indefinitely. However, as long as they remain actual constituents of the living body, they represent links in a chain of continuous reactions in which apparently all organic substances, even those of the storage material, are involved. It is with this aspect of the organic molecule as an active component of the dynamic processes of life that the biochemist is especially concerned. The isotopes of those elements which are present in natural organic compounds, presented to the biologist

by the physical chemist, will certainly furnish a better insight into the details of this intricate mechanism

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## THE ACADEMY SCHOLARSHIPS

Mrs Elizabeth Cochran Bowen has again provided the Academy of Medicine with funds for maintaining two Scholarships, each for one year's study in European clinics. These Scholarships are open to recent graduate internes of municipal or voluntary hospitals of New York City who wish to prepare themselves for the practice of clinical medicine or surgery in any of their branches.

In former years Mrs Bowen desired that the two Scholarships be designated the Alexander Cochran Bowen Scholarships. This year, however, she has indicated her wish that one be called the Alexander Cochran Bowen, and the other, the Harlow Brooks, in memory of that great and well beloved Fellow of this Academy.

## 1 FURTHER STUDIES ON THE INTRAPERITONEAL USE OF BOVINE AMNIOTIC FLUID IN ABDOMINAL SURGERY

J RANDOLPH GEFFERT  
MELVIN L STONE

The authors report the results of the use of Amfetin administered intraperitoneally at the time of operation in a series of one hundred and two gynecological celiotomies. One hundred twenty-five patients having similar operations, but not having Amfetin administered were used as controls. The study was chiefly one of post-operative reaction in treated and untreated patients. The conclusions reached were that the intraperitoneal administration of Amfetin showed no appreciable effect on blood pressure, pulse, temperature or wound infection, but that normal intestinal motility and normal contraction of the bladder seems to return sooner in the treated patients. It is felt that the use of Amfetin at the time of operation holds definite promise of affording the patient some degree of relief from nausea, vomiting, gas pains and distention. The question of prevention of adhesions was not considered in this study.

## 2 A HISTOLOGIC DIAGNOSIS OF PREGNANCY

BERTRAM G SMITH, Ph D  
ENDRE K BRUNNER

The vaginal epithelium may be subdivided into 3 distinct layers—the squamous faintly stained superficial—the squamous darkly stained middle or cornified—and the thick basal layer which corresponds with the stratum germinativum of the skin.

The basal layer is the seat of characteristic changes during pregnancy. The distal portion of the basal zone which is normally made up of lightly stained polyhedral cells will become thicker, and the cells more numerous. The individual cells are larger and the amount of vacuolation roughly twice as great as in the non-pregnant woman.

These changes are present in all age groups and as early as when the patient is within one week overdue.

The material was obtained by biopsies taken without anesthesizing, the size not exceeding 3 mm. Serial sections were made and stained with haematoxylen and eosin. The study was based on 155 biopsies, 79 from cases of pregnancy or suspected pregnancy. In 21% of cases the vaginal epithelium was the seat of chronic inflammation which prevented us from making any other histologic diagnosis. Some of those affected were later proven non-pregnant.

Because of its rapidity, this method might be successfully employed as an additional aid in the diagnosis of extrauterine pregnancy.

### 3 RESULTS OF THERAPY IN THE LUETIC ANTEPARTUM CLINIC AT BELLEVUE HOSPITAL

MORTIMER D SPEISER

Efficient treatment can best be given in a Prenatal Syphilis Clinic properly equipped and staffed. A scheme of treatment is outlined depending upon the stage of the syphilitic infection and the length of gestation. Antepartum treatment not only reduces the incidence of premature deliveries but also the incidence of breech presentations. Postpartum morbidity is exceedingly high in patients with genital lesions who have received no treatment. Treatment in a similar group of patients reduces this incidence. Maceration and early deaths of offspring were fifteen times more frequent in patients who received no treatment as compared with those who received treatment both before and during pregnancy. Syphilitic live children occurred twelve times more often in the untreated group compared with the well treated group. It is never too late in pregnancy to bring about some good by the use of antisyphilitic therapy. Arsenicals given the pregnant woman are attended with an increased risk of reactions. Gastro intestinal reactions, pruritus and icterus lead the list in frequency. While mild reactions are of almost equal prevalence in white and colored patients, severe reactions are encountered with greater frequency in the former group.

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### A SELECTION OF RECENT ACCESSIONS

"Possession does not imply approval"

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Milano, Mondadori, [1936], 825 p
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- Coleman, F Materia medica for dentists 7 ed  
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Paris, Vigot, [1936], 3 v
- Delore, P Tendances de la médecine contemporaine  
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- Desha, L J Organic chemistry  
N Y, McGraw-Hill, 1936, 750 p
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Paris, Doin, 1936, 237 p
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Balt, Wood, 1936, 358 p
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N Y, McGraw-Hill, 1936, 386 p
- Fabre, R Leçons de toxicologie  
Paris, Hermann, 1936, 12 pts in 1 v
- Fahrenkamp, K Essential and commonplace aspects of heart disease  
Ludwigshafen-on-Rhine, Knoll, 1936, 199 p
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- Freud, S The problem of anxiety  
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Berlin, Urban, 1936, 131 p
- Gifford, S R A hand-book of ocular therapeutics 2 ed  
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- Greisheimer, E M Physiology and anatomy [A text book for nurses] 3 ed  
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- Griffith, J P C and Mitchell, A G The diseases of infants and children 2 ed  
Phil, Saunders, 1937, 1154 p

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Scranton, International Textbook Co, [1936], 396 p
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N Y, Funk, [1937], 110 p
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Phil, Lea, 1937, 268 p
- Hay, W H and Smith, (Mrs) E L The Hav system of child development.  
N Y, Crowell, [1936], 232 p
- Hoffman, F L Cancer and diet  
Balt., Williams, 1937, 767 p
- Horney, K The neurotic personality of our time  
N Y, Norton, [1937], 299 p
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- Huard, P and Meyer-May, J Les abcès du foie  
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- Janet, P M F L'intelligence avant le langage  
[Paris], Flammarion, [1936], 292 p
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N Y, Norton, [1937], 575 p
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Paris, Vigot, 1936, 132 p
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N Y, Jewish Science Pub Co, 1936, 345 p
- Linton, R The study of man  
N Y, Appleton-Century, 1936, 503 p
- Lord, E E Children handicapped by cerebral palsy  
N Y, Commonwealth Fund, 1937, 105 p
- Macalpaine, J B Cystoscopy and urography 2 ed  
Balt, Wood, 1936, 478 p
- McGregor, A L A synopsis of surgical anatomy 3 ed  
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nose and throat 6 ed  
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Paris, Mignolet, [1936], 253 p
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Phil, Saunders, 1937, 495 p
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Paris, Masson, 1936, 174 p
- Meyer, H H and Gottlieb, R *Die experimentelle Pharmakologie als Grundlage der Arzneibehandlung* 9 Aufl  
Berlin, Urban, 1936, 876 p
- Miles, A and Wilkie, D P D *Operative surgery* 2 ed  
London, Milford, 1936, 631 p
- Mullen, E A *Modern treatment and formulary*  
Phil, Davis, 1936, 707 p
- Neal, H V and Rand, H W *Comparative anatomy*  
Phil, Blakiston, [1936], 739 p
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- Ohler, W R *The truth about Bright's disease*  
Cambridge, Harvard Univ Press, 1936, 80 p
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- Pregl, F *Quantitative organic microanalysis* 3 Eng ed  
London, Churchill, 1937, 271 p
- Pugh, M A *Squint training*  
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London, Oxford Univ Press, 1936, 243 p
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Cambridge, Mass, Sci-Art, 1936, 265 p
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Springfield, Ill, Thomas, [1937], 343 p
- Sabadini, L *Les kystes hydatiques de la rate*  
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N Y, Funk, [1937], 98 p
- Solomon, C *Pharmacology, materia medica and therapeutics* [2 ed]  
Phil, Lippincott, [1936], 681 p
- Thompson, W S *Operative and interpretative radiodontia*  
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- Trease, G E *A text-book of pharmacognosy* 2 ed  
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- Van de Wall, W and Liepmann, C M Music in institutions  
N Y, Russell Sage Foundation, 1936, 457 p
- Vaquez, H and Gley, P La pression moyenne de l'homme  
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- Vaughan, J M The anaemias 2ed  
London, Milford, 1936, 309 p
- Vaughan, W F General psychology  
Garden City, Doubleday, [1936], 634 p
- Vernon, H M Accidents and their prevention  
Cambridge [Eng], Univ Press, 1936, 335 p
- Vogler, P Die Prophylaxe der Schlafstörung  
Leipzig, Thieme, 1937, 130 p
- Voronoff, S L'amour et la pensée chez les bêtes et chez les gens  
Paris, Faisquelle, [1936], 180 p
- Walker, J W T Surgical diseases and injuries of the genito-urinary organs 2ed  
London, Cassell, 1936, 974 p
- Werner, A A Endocrinology clinical application and treatment  
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- Wilde, R W Health, sickness and psychology  
London, Milford, 1936, 201 p
- Williamson, N B A handbook on diseases of children 2ed  
Edinburgh, Livingstone, 1936, 329 p
- Woodward, H L and Gardner, B Obstetric management and nursing  
Phil, Davis, 1936, 744 p
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Phil, Blakiston, [1936], 924 p

## APRIL

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- Ben'kovich, I L Sosudistye spleteniya mozga pri infektsionnykh zabolevaniyakh  
[Gorky], Gor'kovskoe kraevoe izdatel'stvo, 1936, 104 p
- Bigelow, M A Adolescence educational and hygienic problems  
N Y, Funk, [1937], 99 p
- Blayne, J R Dental pharmacology and therapeutics 2ed  
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- Bowman, K M Towards peace of mind  
London, Allen, [1936], 278 p
- Bray, G W Recent advances in allergy 3ed  
London, Churchill, 1937, 517 p



- Brown, W Mind medicine and metaphysics  
London, Milford, 1936, 294 p
- Cascio, D A new theory on the etiology, pathogenesis, treatment and prevention of cancer  
N Y Vanni, [1936], 233 p
- Clunies-Ross, I and Gordon, H McL The internal parasites and parasitic diseases of sheep  
Sydney, Angus, 1936, 238 p
- Crofton W M The true nature of viruses  
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- DeNormandie R I The expectant mother and her baby  
N Y Funk [1937] 89 p
- Dilling W J and Hillim, S Dental materia medica, pharmacology and therapeutics  
London Cassell, 1936, 328 p
- Eddy W H and Dalldorf, G J The vitaminoses  
Balt Williams 1937, 338 p
- Innis I M Dental roentgenology 2 ed  
Phil, Lea [1936] 331 p
- Lecken, W R Nutritional factors in disease  
London Heinemann 1936 141 p
- Phu, P C Voordrachten over aetiologie, epidemiologie en specieele prophylaxis van de infectie-en parasitaire ziekten van den mensch  
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Phil Lippincott [1937], 130 p
- Glen W C Public health act, 1936  
London, Eyre, 1936, 685 p
- Halliburton, W D Hewitt I A and Robson, W The essentials of chemical physiology 13 ed  
London Longmans, [1936] 350 p
- Hansen H F A review of nursing 2 ed  
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Paris, Masson 1936, 272 p
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- Koelsch, F Lehrbuch der Gewerbehygiene  
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London, Churchill, 1936, 231 p

- Levinson, S A and MacFate, R P Clinical laboratory diagnosis  
Phil, Lea, 1937, 877 p
- Lewis, F P What you should know about eyes  
N Y, Funk, [1937], 82 p
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- Livre jubilaire offert au Docteur Albin Lambotte  
Bruxelles, Vromant, 1936, 578 p
- Iorenz, J Consistency of auditory acuity  
New York, privately printed, 1936, 162 p
- Iove, J K Deafness and commonsense  
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Paris, Masson, 1936, 2 v
- Maherly, A Commonsense and psychology  
London, Muller, [1936], 160 p
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- Macleod, J J R and Sevmour, R J Fundamentals of human physiology  
4 ed  
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- Martius, H E F Die gynaekologischen Operationen  
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- Means, J H The thyroid and its diseases  
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- Mensendieck, B M The Mensendieck system of functional exercises  
Portland, Me, Southwork-Anthoensen Press, 1937, v 1
- Molesworth, E H An introduction to dermatology  
London, Churchill, 1937, 520 p
- Morgan, (Sir) G T and Burstall, F H Inorganic chemistry  
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- Muir, J R Years of endurance  
London, Allan, 1936, 292 p
- Murray, P D F Bones, a study of the development and structure of the  
vertebrate skeleton  
Cambridge [Eng], Univ Press, 1936, 203 p
- Norman, V P Essentials of modern medical treatment  
London, Hutchinson, 1936, 199 p
- Randall, L The famous cases of Sir Bernard Spilsbury  
London, Nicholson, 1936, 319 p
- Rasse und Krankheit Hrsg von J Schottky  
Munchen, Lehmann, 1937, 468 p
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London, Paul, 1936, 294 p
- Rowe, A H Clinical allergy due to foods, inhalants, contactants, fungi,  
bacteria and other causes  
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- Schmid, B Interviewing animals  
London, Allen, [1936], 223 p
- Schmidt, R R The dawn of the human mind  
London, Sidgwick, 1936, 256 p
- Shaw, H L K The healthy child  
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- Stiles, W An introduction to the principles of plant physiology  
London, Methuen, [1936], 615 p
- Stoll, A The cardiac glycosides  
London, Pharmaceutical Press, [1937], 80 p
- Streletski, C Précis de graphologie pratique  
Paris, Vigot, 1936, 379 p
- Terracol, J Les maladies des fosses nasales  
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Erkrankungen der Bauchorgane  
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Toronto, Longmans, 1936, 143 p
- Tobey, J A The common health  
N Y, Funk, [1937], 96 p
- Trauma and disease, edited by I Brahdý and S Kahn  
Phil, Lea, 1937, 613 p
- Walters, R C S The nation's water supply  
London, Nicholson, 1936, 244 p

## MEMBERS ELECTED MARCH 3, 1937

Lester Blum	500 West End Avenue
William Leifer	286 West 86 Street
Olga R Povitzky	72½ Irving Place
Jose A Presno y Bastiony	19 esq a Paseo, Vedado, Habana, Cuba
Louis Schwartz	390 Riverside Drive
William Snow	25-10 Butler Street, East Elmhurst, L I
Solomon Weintraub	240 East 79 Street

APRIL 1, 1937

Charles Haines	421 Huguenot St, New Rochelle
Alexander Altschul	350 Central Park West
John G McGrath	501 Madison Avenue
John Warren Rogers	201 East 40 Street
Arthur A Rosenthal	322 Central Park West
William Thalhimer	30 Beekman Place
James R Beard, Jr	8 West 16 Street
Phineas Bernstein	2 East 85 Street
Linn John Boyd	58 Burkewood Rd, Mt Vernon

## PROCEEDINGS OF ACADEMY MEETINGS

## MARCH

## STATED MEETING

THE NEW YORK ACADEMY OF MEDICINE—March 3

- I EXECUTIVE SESSION—a Reading of the Minutes
- II PAPER OF THE AFTERNOON—Significance of Serologic Tests in Syphilis A Benson  
Cannon Associate Professor of Dermatology College of Physicians and Surgeons
- III REPORT ON ELECTION OF MEMBERS

March 18

THE HARVEY SOCIETY (IN AFFILIATION WITH THE NEW YORK ACADEMY OF MEDICINE)

THE SIXTH HARVEY LECTURE The Control of Excitation in the Nervous System  
Herbert S Gasser Director Rockefeller Institute for Medical Research

## SECTION MEETINGS

SECTION OF DERMATOLOGY AND SYPHILOLOGY—March 2

- I READING OF THE MINUTES
- II PRESENTATION OF CASES—a New York Polyclinic Hospital b City Hospital  
c Miscellaneous cases
- III DISCUSSION OF SELECTED CASES
- IV EXECUTIVE SESSION—Appointment of Nominating Committee

COMBINED MEETING OF THE NEW YORK NEUROLOGICAL SOCIETY AND

SECTION OF NEUROLOGY AND PSYCHIATRY—March 2

- I PAPERS OF THE EVENING—a The organic syndrome in the psychoses Samuel W Hamilton  
(by invitation) b Constitutional factors in the paranoid psychoses Nolan D C Lewis  
(by invitation) c An evaluation of the biochemical approach to the psychoses  
William H Dunn (by invitation) Discussion Karl M Bowman (by invitation)  
Wendell Muncie Baltimore (by invitation)

SECTION OF SURGERY—March 5

- I READING OF THE MINUTES
- II PRESENTATION OF CASES—a Cases of giant cell tumor of the long bones Norman L  
Higinbotham b 1 Suppurative arthritis of knee joint with osteomyelitis Resection  
of joint and fusion 2 Popliteal bursitis connecting knee joint Two cases Conduct  
W Cutler Jr c Spontaneous healing of gangrene of lower extremity Saul S Samuels
- III PAPERS OF THE EVENING—a The causal relationship of thromboangitis obliterans and  
typhus fever Charles Goodman b Human bite infections of the hand Roland L  
Maier (by invitation)

## IV GENERAL DISCUSSION

## V EXECUTIVE SESSION—Appointment of Nominating Committee

## SECTION OF HISTORICAL AND CULTURAL MEDICINE—March 10

I EXECUTIVE SESSION—*a* Reading of the Minutes *b* Nomination of Section Officers and one Member of Advisory CommitteeII PAPERS OF THE EVENING—*a* Jonathan Hutchinson The last of the multispecialists Gordon M Bruce Discussion Beeckman J Delatour *b* William Henry Perkin, with exhibit of books Herman Goodman Discussion Victor Robinson (by invitation)

## SECTION OF PEDIATRICS—March 11

## I PAPERS OF THE EVENING—Program from the Department of Pediatrics Yale University

- a* An immunological comparison of six strains of the virus of poliomyelitis J D Trasl (by invitation) J R Paul (by invitation) Discussion Thomas M Rivers S D Kramer (by invitation) *b* 1 Factors controlling the distribution of body water Daniel C Darrow (by invitation) Herman Yannet (by invitation), 2 Changes in distribution of body water in artificial fever Herman Yannet (by invitation) Daniel C Darrow (by invitation) Discussion Samuel Z Levine A A Weech (by invitation)

## II EXECUTIVE SESSION—Appointment of Nominating Committee

## SECTION OF OPHTHALMOLOGY—March 15

*Program arranged by the INSTITUTE OF OPHTHALMOLOGY, Presbyterian Hospital*

## INSTRUCTIONAL HOUR 7 00 to 8 00 p m—Contact glasses Gordon M Bruce

DEMONSTRATIONS 7 30 to 8 30 p m—*a* Photography Laurance Redway (by invitation) *b* Fundus pictures Gustav Bethke (by invitation) *c* Instrument for detached retina operations Kern Larkin (by invitation) *d* Anatomical variations in the optic canal, Raymond Pfeiffer

## REGULAR PROGRAM

I EXECUTIVE SESSION—*a* Reading of the Minutes *b* Appointment of Nominating CommitteeII PRESENTATION OF CASES—*a* Surgery of the cornea Ramon Castroviejo *b* Essential atrophy of the iris Hugh S McKeown *c* Treatment of tobacco alcohol amblyopia Frank D Carroll (by invitation)III PAPERS OF THE EVENING—*a* Studies on chronic catarrhal conjunctivitis Preliminary report Philips Thylson (by invitation) *b* Orbital cysts without epithelial lining John M Wheeler

## COMBINED MEETING OF THE NEW YORK HEART ASSOCIATION

## AND THE SECTION OF MEDICINE—March 16

I EXECUTIVE SESSION—Section of Medicine—*a* Reading of the Minutes *b* Appointment of Nominating CommitteeII PAPERS OF THE EVENING—*a* Cardiac dyspnea Tinsley Harrison Nashville Tennessee (by invitation) Discussion Harold J Stewart Dickinson W Richards Jr (by invitation) *b* Cardiac diseases—nosology and the public health Alfred E Cohn Discussion John Wackoff

## III GENERAL DISCUSSION

## SECTION OF GENITO URINARY SURGERY—March 17

I EXECUTIVE SESSION—*a* Reading of the Minutes *b* Appointment of Nominating CommitteeII CASE REPORTS—*a* The vena cava—bifurcated by the ureter Autopsy specimen Fedor L Scnger *b* A consideration of ureteral anomalies with special reference to partial duplication with one branch ending blindly A report of two cases with renal obstruction cured by surgical resection Augustus Harris

- III PAPERS OF THE EVENING—a Conservative management of damaged renal tissue Jefferson C Pennington and Earl C Lowry Nashville Tennessee (by invitation) b Diabetes in surgical urology John Duff Frederick W Williams Discussion opened by Edwin T Hauser Discussion Joseph Hyams Robert Gutierrez J Sturdivant Read

IV GENERAL DISCUSSION

SECTION OF OTOLARYNGOLOGY—March 17

Held at the College of Physicians in Philadelphia

The Section was the guest of the Section of Otolaryngology of the College of Physicians

- I EXECUTIVE SESSION—a Reading of the Minutes b Appointment of Nominating Committee
- II PAPERS OF THE EVENING—a Acute leukemic labyrinthine disease Horace J Williams b Significance of experimental otology Walter Hughson (by invitation) c Bronchoscopy in the management of postoperative pulmonary complications Gabriel Tucker Discussion opened by Page Northington Edmund Prince Fowler Charles J Imperatori Marvin Jones John D Kerran John M Lore

SECTION OF ORTHOPEDIC SURGERY—March 19

- I EXECUTIVE SESSION—a Reading of the minutes b Appointment of Nominating Committee
- II PAPER OF THE EVENING—A new approach to the problem of low back pain Horace C Pitkin San Francisco (by invitation) Discussion Loring T Swaim Boston (by invitation) Walker E Swift Lewis Clark Wagner
- III GENERAL DISCUSSION—Leo Mayer Mather Cleveland

SECTION OF OBSTETRICS AND GYNECOLOGY—March 23

*Program presented by the OBSTETRICAL AND GYNECOLOGICAL SERVICE  
OF BELLEVUE HOSPITAL*

- I CASE PRESENTATION—a A case of adenomyosis in a primipara resulting in spontaneous rupture of the uterus at the onset of labor Melvin L Stone (by invitation)
- II PAPERS OF THE EVENING—a Further studies on the intraperitoneal use of bovine amniotic fluid in abdominal surgery, J Randolph Gelfert (by invitation) Melvin L Stone (by invitation) Discussion R Sterling Mueller (by invitation) John Jacob Westermann Jr William Seaman Bainbridge b A histologic diagnosis of pregnancy Endre K Brunner (by invitation) Discussion Bertram G Smith Ph D Samuel H Geist c Results of the apy in the luetic antepartum clinic at Bellevue Hospital Mortimer D Speiser Discussion Alfred C Beck Taurman Boyd Givan (by invitation) Walter Clarke (by invitation)
- III EXECUTIVE SESSION—Appointment of nominating committee

AFFILIATED SOCIETIES

NEW YORK ROENTGEN SOCIETY *in affiliation with*  
THE NEW YORK ACADEMY OF MEDICINE—March 15

- I 8 00 8 15 PRESENTATION OF INTERESTING CASES
- II PAPERS OF THE EVENING—a Pathogenesis of tuberculosis Harry Wessler (by invitation) , Discussion opened by J Burns Amberson Jr (by invitation) Paul Klemperer (by invitation) Ross Golden b The oblique projection of the thorax an anatomic and roentgenologic study Carleton B Peirce (by invitation) Discussion opened by Dickinson W Richards Jr (by invitation) Richmond L Moore (by invitation) Bruce W Stocking (by invitation) George J Plehn
- III EXECUTIVE SESSION

NEW YORK MEETING OF THE SOCIETY FOR EXPERIMENTAL  
BIOLOGY AND MEDICINE—March 17

- I The production of specific enzymes by micro organism Rene Dubos, Rockefeller Institute
- II The relation of calcium to protein in hyperproteinemia A B Gutman and E B Gutman College of Physicians and Surgeons
- III Distribution in body fluids of ingested potassium chloride and ammonium chloride and their mode of excretion Jacques Bourdillon Rockefeller Institute
- IV Certain factors involved in the correlation between age and organ response to hormonal stimulation Earl T Engle College of Physicians and Surgeons

NEW YORK PATHOLOGICAL SOCIETY *in affiliation with*  
THE NEW YORK ACADEMY OF MEDICINE—March 25

NOTICE—As the annual meeting of the American Association of Pathologists and Bacteriologists was held in Chicago on the date of the regular meeting of the New York Pathological Society no meeting of the Pathological Society was held in March

## DEATHS OF FELLOWS

GOLDENBERG, HERMANN, M D, 128 East 72 Street, New York City, graduated in medicine from the Royal Bavarian University of Munich in 1886, elected a Fellow of the Academy April 2, 1891, died April 1, 1937

Dr Goldenberg held a certificate from the American Board of Dermatology and was consulting dermatologist to the Mount Sinai and Bronx Hospitals. He was a Fellow of the American Medical Association and a member of the County and State Medical Societies.

JARECKY, HERMAN, A B, M D, 120 West 86 Street, New York City, received the degree of Bachelor of Arts from the College of the City of New York in 1883, and graduated in medicine from the College of Physicians and Surgeons in 1886, elected a Fellow of the Academy June 7, 1900, died March 14, 1937.

Dr Jarecky had been consulting otolaryngologist to the Sydenham Hospital. He was a member of the American Academy of Ophthalmology and Otolaryngology, the Alumni Association of City Hospital, the American Medical Association and the County and State Medical Societies. He was the author of various papers on diseases, operations and treatment of eye, ear, nose and throat.

SPIES, EDWIN ALBERT, M D, 24 East 36 Street, New York City, graduated in medicine from Fordham University School of Medicine in 1910, elected a Fellow of the Academy November 2, 1922, died March 21, 1937.

Dr Spies, at the time of his death, was adjunct professor of orthopedic surgery at the New York Polyclinic Medical School and Hospital, orthopedic surgeon to the Morrisania and Misericordia Hospitals and consulting orthopedic surgeon to St Francis' Hospital, Poughkeepsie. He held a certificate from the American Board of Orthopedic Surgery.

Dr Spies was a Fellow of the American College of Surgeons, the American Medical Association and a member of the State and County Medical Societies.

## THE GRADUATE FORTNIGHT

The subject of the Tenth Annual Graduate Fortnight of the Academy which will be held from November one to twelve is, The Medical and Surgical Disorders of the Urinary Tract. The program gives promise of providing a valuable and interesting symposium. Fortunately, the subject embraces medicine and surgery and many allied special fields. The Committee has made every effort to provide an integrated program with topics of present interest, which will be discussed by men particularly qualified to present the subject with authority and clarity. The Committee has also arranged morning and afternoon clinics in leading hospitals of New York City which have, as in past years, generously cooperated in the plans for this year's program. Insofar as possible the hospital clinics each day will be devoted to the topics of the evening program of the same day. The rich store of clinical material available in this city will thus be demonstrated by distinguished clinical teachers, including such leading men from other medical centers of this Country as may be invited jointly by the participating hospitals and the Academy.

The subject of this year's Fortnight is unusually suitable for Exhibits. The Committee therefore plans to exploit this opportunity fully, particularly with a view to having special demonstrations of exhibits on two afternoons of each week.

In general terms the first week of the Fortnight will be devoted to medical and the second week to surgical subjects. The program of the evening meetings follows:

Physiology of the kidney	Alfred N. Richards
Tests for kidney function	Donald D. Van Slyke
Edema and its treatment	Dana Atchley
Uremia and pathology of kidney function	Arthur M. Fishberg
Pathology of vascular disease	Milton C. Winternitz
The pathology of nephritis	George Baehr
Clinical aspects of nephritis	Robert F. Loeb
Nature of hypertension	Irvine H. Page
Clinical aspects of hypertension, including malignant hypertension	Herman O. Mosenthal
Evaluation of the surgical treatment of hypertension	George J. Heuer
The nephroses	Albert A. Epstein
Vascular and renal complications of pregnancy	W. W. Herrick
The psychological factor in hypertension	Karl A. Menninger
Pathogenesis and treatment of renal infections	William F. Braasch
Renal and perirenal infections	Hugh Cabot
Renal tuberculosis	John R. Caulk
Calculus disease. The formation of stones	Linwood D. Keyser
Clinical aspects of calculus disease	Henry G. Bugbee
Hydronephrosis and pyonephrosis	J. Bentley Squier
Bright's disease in children	John D. Lyttle
Common urologic diseases in children	Meredith F. Campbell
Radiotherapy of tumors of the urinary tract	Benjamin S. Barringer
Tumors of the kidney and ureter	Archie L. Dean, Jr.
Tumors of the urinary bladder	Edwin Beer
Pathologic physiology of bladder neck obstructions	William E. Lower
Transurethral resection of bladder neck obstructions	Joseph F. McCarthy
Surgical treatment of obstructions at the neck of the bladder	Hugh H. Young



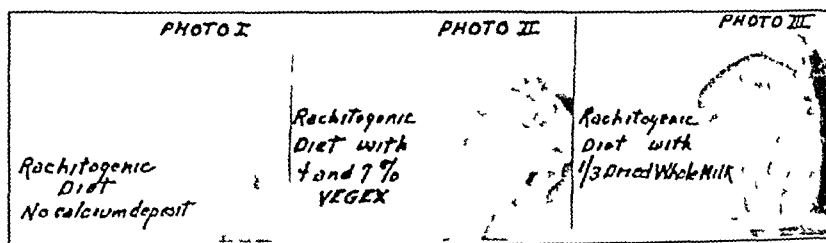


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## The Hermann Michael Biggs Memorial Lecture THE BEARING OF THE RESULTS OF RECENT STUDIES IN NUTRITION ON HEALTH AND ON LENGTH OF LIFE\*

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In the days of Darwin, science awoke to the importance of heredity, and the great wave of interest therein aroused has been in full flood for two generations. Through the work of Pasteur and his contemporaries, the great importance to human life of the bacteriology and sanitation of the body's surroundings was made clear, and for a generation students and administrators of public health problems have naturally and properly concentrated their attention upon the triumphant use of bacteriology and sanitation in the control of infectious diseases and the reduction of the death rates of early ages.

Recognition of the health importance of nutrition had to wait until after these two grand divisions of natural knowledge had become assimilated. Now, beginning in our own generation, the chemistry of nutrition is adding its contribution correctively, in the prevention of deficiency diseases, and also constructively in the improvement of already-normal health and the extension of the life expectation of grown people as well as of children. Chemical research into the processes of nutrition and into the nutritive values of foods is developing a new view of

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the extent to which the life processes, and more especially the life process as a whole, can be improved through a more scientific choice and use of food

With the discovery of vitamins and of the importance of mineral elements in nutrition and food values, science is just now arriving at a serviceably complete qualitative knowledge as to what chemical factors the food must furnish to protect the body from nutritional deficiencies. Hence the term "protective foods" which McCollum introduced some years ago and which subsequent research has justified in an even broader sense than first conceived. For the liberal use of these foods has been found not only to forestall what are otherwise the most frequent deficiency conditions but also to diminish somewhat the incidence or severity or duration of some diseases other than those which are primarily nutritional. This latter fact was effectively presented by Dr. Wilder in his Chairman's Address to the Section on Therapeutics of the American Medical Association at its Philadelphia meeting. As he emphasized, the nutritional background and foundation afforded by the habitual use of a dietary which is thoroughly well-balanced, with reference to the newly discovered as well as the longer-known factors, may greatly advance the probability of a satisfactory outcome of whatever medical measure is to be undertaken. He also suggested that in disease the rate of destruction of a vitamin in the body may be increased or for some other reason the amount needed for best results may be larger than the normal nutritional requirement. Even though this idea may have been held too enthusiastically in some quarters, there is good scientific evidence of its validity as judiciously set forth by Dr. Wilder, and, as the Journal of the American Medical Association has remarked, the profession is not to be deterred from the right use of new knowledge even when it is at the same time engaged in the correction of exaggerated hopes or claims.

The concept of a possibly rather wide zone between the merely adequate and the optimal in some aspects of nutri

tion, which appealed to Wilder on clinical and therapeutic grounds, simultaneously received strong support from laboratory investigation. On the basis of his feeding experiments, McCollum early began to point out that there may be a difference between the passably adequate and the optimal in nutrition, and Hopkins in 1931 emphasized the view that such differences may have far-reaching effects which have previously been attributed to racial factors. For, he explains, a community may be found in equilibrium with an environment which includes its food supply, and the fact of such equilibrium has hitherto been taken as evidence that the environment supplies everything needed. Hence any inferiority was taken to be racial, whereas in fact a racial potentiality of higher development may become manifest with an improvement in the food supply.

Present-day science in general, and perhaps particularly laboratory experimentation, is constantly striving to make itself more and more quantitatively exact, and so one aspect of nutrition research is pressing on from the qualitative recognition of the chemical factors needed in nutrition to the quantitative questions. How much of these do different foods contain? How much does normal nutrition require? and finally to the more ambitious and far reaching question, How much yields the best result as judged by well-being throughout the life cycle and through successive generations?

When the study of human nutrition brings us to problems so comprehensive as this, we obviously need a deputy-subject in the form of an experimental animal whose natural life cycle is short enough to permit of full-life-cycle experiments, and whose food habits and nutritional processes are much like our own. These qualifications are fulfilled by the long domesticated laboratory rat, and for our nutrition research at Columbia we have built a laboratory-bred experimental colony in which the hereditary and nutritional background of each individual is known for so many generations as to correspond with a human colony whose food supply had been known, whose

blood had been unmixed and whose family trees could be traced in all their branches, since times somewhere between Caesar and Charlemagne. With experimental animals of small size and short life, it becomes possible to study the influence of food upon health and upon length of life under conditions of fully adequate scientific control, and with large enough numbers to smooth-out the pitfalls of individual variation and to permit of convincing statistical analysis of the findings.

These experiments originated in a study of the food supply problems of the war and post-war periods and the limited purchasing power of the majority of people. Wheat was taken as typical of the low-cost foods furnishing the greater part of the nutritional calories, and milk as the typical protective food to "balance" the dietary. It was found that five parts by weight of ground whole wheat could be adequately balanced by one part by weight of dried whole milk. But an increase in the proportion of protective food, in this case milk, made the diet better, and thus enhanced the norms of health at all ages, and increased the length of life. Here, as in most scientific research, the laboratory conditions were purposely kept simple in the interest of perfection of control and certainty of interpretation. The simplification which permitted completeness of control and large numbers of experiments was helpful to the definite establishment of the principle, but does not imply any recommendation of equally simplified human dietaries. In terms of our usual food supplies the indicated improvement would mean more of fruits, of vegetables, especially the green and yellow ones, and of milk including such of its products as cheese, cream, and ice cream, probably with no decrease of egg consumption. In the experiments referred to, the single change in proportions of the staple foods composing the dietary involved its enrichment, to a substantial degree in calcium and vitamins A and G, and to a relatively small degree in protein.

In such experiments it has been found that a dietary or food supply which is already adequate to support normal

growth and reproduction and maintain normal health and length of life, generation after generation, may still be capable of such improvement as very significantly to enhance the average of nutritional well-being, with resulting higher health at all stages of the life cycle. Growth and development were expedited, a higher level of adult vitality was maintained, and the life expectation not only of the young but also of the adults was improved. The increase in the average length of adult life was such as would correspond to an increase in the human-adult life expectation from the long-standing 70 years to 77 years instead.

This positive effect of nutritional improvement in extending an already-normal average length of adult life, though still, of course, within the range of the normal zone, was a more constructive finding than had been anticipated, and so this finding has naturally been submitted to cross examination. The three questions most often asked in this connection are

- (1) How certain is the finding?
- (2) As the experiments were with rats, how do we know that the result is true for man?
- (3) Is longer life desirable anyway?

As to the first of these questions, statistical analysis shows the finding to be established with 100 times the degree of convincingness that is regularly accepted as "undoubted." This is an eminently appropriate occasion on which to plead for a wider recognition of the fact and principle thus fully established, that the hitherto accepted norms of health and of length of life can be advanced, enhanced, improved by a more scientific distribution of emphasis in the choice and use of food. Previously only heredity had been positively correlated with length of life, now food and nutrition have also been. Granted that heredity may be the largest factor in longevity, the food factor should no longer be overlooked. The statement or implication so often met, even in supposedly authoritative writings, that, while there are many ways to shorten a

normal life cycle, the only way to lengthen it is by the selection of a longer-lived ancestry, should now be definitely recognized as out-of-date. In fact it is doubly out-of-date, in that it is not true to present-day factual evidence, and that it is too fatalistic to be soundly scientific in spirit. Heredity and nutrition are both positive factors, and it is possible, by means which are within our own immediate control, both to "add life to our years," and to add years to our lives.

As to the second question, the chemistry of human and of rat nutrition is strikingly similar in most respects, and on the chief point of known difference we are more responsive to dietary improvement than are rats. Hence the possibilities of improvement revealed by experiments with rats are almost certainly within the scientific probabilities for us human beings. And this, it may be emphasized, is not an assumption, and not merely a hope, it is the only view consistent with the scientific evidence.

On the third point, much more might be said than we have time for here, but a glance at the significance of an extension of the prime of life seems certainly in order; for the newer chemistry of nutrition offers an extension of the prime of life of still greater extent than the increase in the life-cycle, development being moderately expedited and senility decidedly deferred in the same individuals by the same dietary improvement, namely, greater prominence of the protective foods in the dietary or food supply.

Commenting on the shortness of human life, the late Dr. R. S. Woodward remarked that a scientific or professional man will usually have spent a third of his years by the time he has finished his formal schooling and begun his life work, then about another third must generally be spent in developing his capacities and in proving what he can do, before he is entrusted with his highest responsibilities and opportunity, and so only one third of his years remain in which to render his best service to the world. A recent charting of age incidence of major opportunity showed that such opportunity is most frequently attained

only at about fifty as Woodward suggested, and it also showed that, in occasional cases, major opportunity may be encountered much earlier or much later

There can be no doubt that to reach the prime of life a little earlier and to hold it a good deal longer may add very greatly to the individual's chance to achieve his ideals, and to render to others the full measure of his best service, for both these take time, even with full opportunity. The significance of this to human welfare may be still more far reaching

As President Merriam of the Carnegie Institution of Washington has pointed out in his essay entitled, "Are the Days of Creation Ended?", the direction of human evolution is now largely social, and society is a continuing organism interested in its own future. What promises to affect this future should influence our decisions from day to day and will do so more effectively with the growth of the scientific spirit which expects progress and works for it, but meanwhile the shortness of individual lives tends to set a limit to the actual use by man of the knowledge which he has accumulated and the institutions which he has built and developed. Hence the longer term of fully efficient years, which the newer chemistry of nutrition offers, may be of far reaching significance to human progress in affording fuller opportunity for the use and enjoyment of the ever growing body of knowledge

It is doubtless with such facts in mind that Dr. McLester, in his Presidential Address to the American Medical Association, has said that science offers to those peoples who will use the newer knowledge of nutrition, not only enhanced vitality and longer life, but also higher levels of cultural development

Our knowledge in this field is at present in a stage which calls for the clearest possible emphasis on two facts which may not always at first thought seem consistent. These are that, on the one hand, there is enough of this new knowledge sufficiently established to justify acting upon it now, and, on the other hand, that much more research



is needed to develop its full potentialities for service to human welfare and to our better understanding of our own life processes and of the world in which we live

Undoubtedly, the great majority of people will be benefited, the general level of the public health will be raised, and the averages of our vital statistics improved at many points by the simple taking of a larger proportion of the needed nutritional calories in the form of the protective foods

Undoubtedly, also, the pressing forward of such further and more quantitatively exact experiments as are only just now being started, and are still seeking adequate means of material support, will greatly advance and clarify the nutritional aspects of biology, chemistry, medicine and public health and enable these sciences to use the new knowledge even more fully and with greater economy and efficiency in the service of food economics, practical dietetics, and human welfare. This fact, that recent studies mark advances of much practical value for health while also there is urgent need of further research, is true for problems ranging all the way from the feeding of an individual to the effort to make nutritional knowledge effective on a world-wide scale. In prescribing for a patient, in feeding a family, in the nutritional aspects of social work, home economics extension, and community health education, there is steady growth of the conviction that the so-called protective foods should be given a larger place in the dietary, the food budget, the community or national food supply, and immediately following upon this conviction comes the question, Just how much larger? Just what proportion of our calories should be consumed in, or what proportion of our expenditure allotted to, the protective foods? Similarly in the world movement, the Health Organization of the League of Nations finds in the published data of recent investigations ample evidence that more liberal levels of food-calcium consumption are needed by a large proportion of the people in many if not most parts of the world. The Director of this Organization, in preparing for a world-wide discussion among ex

perts and educational effort through them to the people, asks us to suggest quantitative standards not only for minimal adequacy but also for optimal results as judged by nutritional well-being throughout the life cycle, and our laboratory methods are now developed to the point of permitting experimental elucidation of this problem. These experiments need to be carried out in larger numbers than have yet been started so that three to four years more of active experimentation are required before the added data thus actively demanded can be complete.

Thus we are, at the moment, in position to study experimentally, and we greatly need to know more about, the quantitative distribution and causes and extent of variation of the outstandingly important mineral elements and vitamin values of staple foods, and the levels of consumption of these nutrient factors which yield best results in the life history of the individual and the vitality of successive generations.

Mention has already been made of the improvement of an already adequate dietary by the increase in its proportion of staple protective food, and the fact that enrichment of the dietary in calcium, in vitamins A and G (the flavin factor) all played parts in the enhancement of nutritional well-being and resulting higher vitality and longer life thus induced. Possibly the relatively smaller enrichment in protein may also have played a supplementary part. Here there has been decided advancement of health and of length of life by improvement of an already-adequate dietary or food supply.

It thus becomes quite clear that there is a very important difference between the merely minimal adequate and the optimal in nutrition. But it does not follow that the actual optimum has yet been established. For our experiments with still higher levels of nutritional intake of calcium and of the flavin factor, while still only in their preliminary stages, give distinct promise of further enhancement of nutritional well-being at these higher levels of intake of these particular chemical factors of food value and nutritional need.

Probably no scientific student of nutrition or of health could have anticipated the extent to which this newer chemistry of nutrition can advance the normal standard of health through affording scientific guidance in the daily choice and use of our staple articles of food. Sir John Boyd Orr has recently written "This new knowledge of nutrition, which shows that there can be an enormous improvement in the health and physique of the nation, coming at the same time with the greatly increased powers of producing food, has created an entirely new situation which demands economic statesmanship." The question as to what proportion of the British people have a food supply sufficient for the development and maintenance of the standard of health which should be the birthright of their racial inheritance has been actively debated in Parliament and anxiously studied by scientific workers, and from Downing Street there has been sent to the British colonies and dominions throughout the world a state paper entitled Nutrition Policy which proposes that throughout the Commonwealth of British Nations with their dominions, colonies, and mandates, the making of tariffs, the setting of quotas, and other such actions shall be guided by a definite policy of bringing into human consumption the kinds and amounts of foods most conducive to optimal health. The Delegate of Australia to the League of Nations has also stimulated the worldwide awareness of importance of nutrition by his slogan, "Marry Agriculture with Health." The official report of our Federal Secretary of Agriculture assures us that the goal of agricultural research and adjustment is the optimal nutrition of the people, and a recent news item reports that the schedule of allowances to farmers for cooperation in the Soil Conservation Program for 1937 is "more attractive to the dairy farmers and vegetable and fruit growers than it was" in 1936, while "Federal money flowing to the cotton farmers will be somewhat reduced." If this wording as quoted from the New York Herald-Tribune makes the action of the Federal Government sound a trifle paternalistic, is it any more so than what is done every time the tariff is revised?

Sir F. Gowland Hopkins, Past-President of the Royal Society, writing in 1936, characterizes nutrition as "a national problem of unsurpassed importance." And he commends the study of M'Gonigle and Kirby's *Poverty and Public Health*, in which they say "It must be admitted that many children of today are the victims of physical defects, and that these defects cannot but lower their efficiency and must in some cases shorten their lives. The evidence that has been adduced indicates that suboptimal nutrition plays a predominately important part in the production of these defects." In their opinion "Sir John Boyd Orr's estimate of ten million people in Great Britain living at or below the threshold of adequate nutrition is . . . an underestimate." They further state that "The accumulated evidence—statistical, clinical and observational—appears to warrant the conclusion that nutrition has, in the practice of clinical and State medicine, received less recognition than it deserves."

On the other hand it has been and is being emphasized by many physicians as well as in the teaching of food work in schools and colleges and in the work of extension teachers and of social relief agencies. Dr. Minot, Nobel Laureate in Medicine, tells us that man's future will depend very largely upon what he decides to eat. His word "decides" is well chosen, for conscious choice of daily food is the chief means through which scientific knowledge in this field becomes effective.

Whatever the attitude of any governmental authority on the question of fostering the production and consumption of a larger proportion of the "protective" food crops, such a shift of emphasis has already begun and will doubtless continue through the steady working of an increasingly informed and intelligent consumer demand. Statistics of food supply show that this is already happening, in fact that it has been going on gradually for some years. It is probably largely because of this gradual improvement in our use of food during the recent past that the public health has kept up as well as it has under the stress of

the economic depression, and that both boys and girls now enter college better developed at a slightly earlier age than their fathers and mothers. With the steady spread of the newer knowledge it will doubtless be used more fully as time goes on, for, as editorially remarked by the Journal of the American Medical Association, "the difference between buoyant health and merely passable health is coming to be more appreciated."

So far as can be judged from present scientific evidence, nutrition is not an alternative way of reaching a pre-determined limit, but rather its benefits are added to all the benefits which one may enjoy through heredity, training, and the sanitation of the external environment. Beside these latter there is the factor of the body's internal environment, and this we are learning to understand, to control, and constructively to improve through the newer chemistry of nutrition.

Being internal and having to do rather with the efficiency of coordination of the life processes than with the great accentuation of any one of them, such chemical improvement through nutrition does not show itself dramatically as a mutation may, and as do some of the exploits of endocrinology, but it may be no less far-reaching because it is working in harmony with natural evolution. Moreover, by its very success this newer chemistry of nutrition is rapidly outgrowing the stage of easily dramatized advances such as are reducible to picturesque and specific words. The question, "What particular thing does such nutritional improvement do?", hardly admits of a simpler or more specific answer than that it offers us the option of a more liberal term of years of more efficient life with which to do what we will.

One of Dr. Biggs' most quoted sayings was that public health is purchasable. To fit nutrition into the concept of public health as a purchasable commodity requires an amplification of the educational function of the physician and the health department, and a further development of nutrition teaching in the schools. The community as a

body does directly purchase out of tax funds, and for all the people equally, as complete a system of sanitation and as good a water supply as the available purchasing power permits, but food is purchased by each consumer individually. A good health officer by his own administrative action may extend the benefits of a discovery in sanitation to all the people of his community, often without their needing to know or to do much if anything about it as individuals, but in the main the people can benefit by a discovery in nutrition only as they individually learn about it and decide to be guided by it.

Simple redistribution of the present expenditures for food, and this without omitting any article of food to which any consumer is accustomed but merely by easy shifting of relative proportions, can undoubtedly contribute greatly to the advancement of the standard or norm of health and vitality in the coming years. Naturally we also hope that a larger proportion of people will soon have ampler purchasing power, and we realize that right relations between purchasing power and the general level of prices is essential to the ability of any community to get the full benefit of the new knowledge of nutrition. However, it should be realized with equal cogency that in the light of this new knowledge, food economics henceforth should concern itself less exclusively with prices and should be more guided by considerations of nutritive values of foods. For it is now clear to anyone who will study the evidence, that nutrition has greater constructive potentiality than science had foreseen, and that even in the everyday choice of food we are dealing with values which are above price, for the health and efficiency, duration and dignity, of human life.



# THE CONTROL OF EXCITATION IN THE NERVOUS SYSTEM

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Harvey Lecture, March 18, 1937

Ten years ago Professor Erlanger addressed the Harvey Society on the subject of the action potential of nerve. In that lecture he described the technique of recording the action potential with the cathode ray oscillograph and presented the developments which had taken place through its use in the laboratories of Washington University. One of the principal points which he made in the lecture was that a peripheral nerve is made up of fibers which conduct impulses at various velocities. If a nerve be stimulated with an induction shock, all the impulses start out together, but they soon become spatially separated, as the faster out run the slower impulses. Thus, if a lead be taken at some distance from the stimulated point, the near electrode records first the fastest impulses and then in turn the slower impulses as they arrive. As all velocities are not equally represented, the composite action potential appears as a series of elevations, the exact configuration of which is dependent upon the fiber content of the particular nerve that is being tested.

In 1927 the potentials of all the fibers had not yet been recognized, consequently an appropriate point at which to start the presentation of this evening is the picture as it was completed two years later through the finding by Professor Erlanger and myself<sup>10</sup> in somatic nerves, and by Bishop and Heinbecker<sup>4</sup> in visceral nerves, of a system of fibers in which the velocity of conduction was much slower than the velocities previously known. These fibers were called C fibers. In mammalian nerves the largest fibers, which are the fibers of fastest conduction, carry impulses at 100 meters per second, and the slowest at less than one meter per second. An idea of the distribution of the velocities may be gained from the electrical map of the saphenous

nous nerve (Fig 1) The fast group, made up of velocities between ninety and fifteen meters per second, appears with two major and several secondary elevations Although the second elevation represents about as many fibers as the first, it is much smaller, since it is produced by smaller fibers and individual fibers contribute potential to the aggregate in proportion to their cross sectional area The third or C elevation, made up of velocities below 17 meters per second, represents many more fibers than the other two elevations combined,<sup>32</sup> but the component potentials are so small that in order to reveal the presence of the fibers it is necessary to use an amplification higher than is needed for the elevations produced by the large fibers It must also be recorded on a much slower time scale

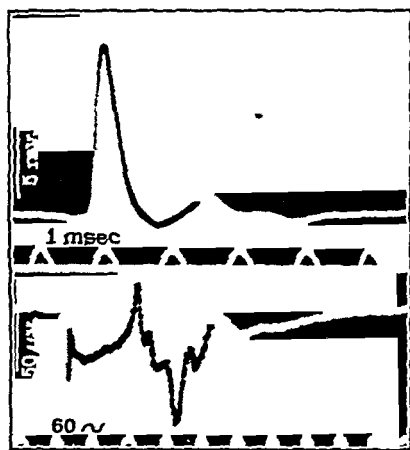


Figure 1

Nerves going to muscles differ from the saphenous nerve, which is purely sensory, in that the first elevation is relatively somewhat higher, owing to a large content of fibers of the highest velocities,<sup>9</sup> some of which are higher than the maximum velocities found in the saphenous nerve These fibers are in part motor and in part sensory, the sensory fibers going to proprioceptor endings in the muscles

What may be the significance of this wide range of velocities is a question which we have often asked ourselves



The velocities of motor fibers are distributed about a single mode, the velocities of sensory fibers about a number of modes. This fact suggested the possibility of a relationship between the elevations in the action potential and the modalities of sensation, but the experimental evidence has turned out for the most part to be incompatible with this notion. The fastest fibers carry touch impulses but not pain, and the C fibers carry pain without touch or pressure.<sup>5</sup> However, pain is also found in the second elevation,<sup>22</sup> and overlaps warmth and probably pressure.<sup>13</sup> In fact it is not clear that some fibers may not mediate both pain and pressure (Goldscheider,<sup>18</sup> Adrian<sup>1</sup>). There surely must be, therefore, some reason other than the modalities of sensation for the numerous velocities. A suggestion as to what may be their function will be made later, but before discussing the matter further it will be necessary to consider some other qualities of the action potential and their relation to the physiology of the central nervous system.

The aspects of the functioning of the nervous system which we examine in the laboratory are so far removed from the manifestations of activity which we experience in everyday life that it may be worth while to say a word at the outset concerning the relation of laboratory studies to the larger problem. Admittedly the nervous system can be understood only as it is operating as a whole, but it is equally true that an insight into its working can be gained only by a detailed analysis of its parts. If the isolation of a part results in the sacrifice of some of its qualities, the loss is compensated for by the acquisition of a degree of simplicity making the part more amenable to investigation. The organization of the nervous system is such that an understanding of the mode of activity of any part of the ganglionic apparatus would mean a long step forward, for all parts of the nervous system are fundamentally alike. We can, therefore, proceed, confident in the belief that when the parts are understood, they can be added together into larger units, and that, as the addition takes place, the lost

qualities will again emerge and be recognized. Bit by bit it should be possible in the end to build back to the elaborate patterns of activity which are characteristic of the intact organism.

Like all other parts of the body, the nervous system is made up of cells. This statement contains the essence of the neurone doctrine which for half a century has dominated all thinking about the subject. The most obviously distinctive feature of neurones, as compared with cells in general, is the profuseness of their branching. Neurones are fashioned in a way so as to make possible numerous discrete contacts of one with the other. The anatomy of the nervous system puts before us myriads of possible pathways over which messages may pass from any part of the body to any other. The physiology of the nervous system reminds us that the utilization of these pathways is restricted. Excitation initiated in any part of the peripheral field does not spread in all directions in the centers, but proceeds along lines which are prepared for it, although not fixed in nature. A given afferent stream of impulses over a peripheral nerve may follow one pathway in the centers at one time and another pathway at another time. The direction of the switching is conditioned by the situation obtaining at the moment, and is always consonant with a coordinated reaction of the whole organism. Every junction point of the transmission lines at the synapses between cells is guarded. Anatomical peculiarities of the form and arrangement of endings differentiate the ease of transmission spatially, and the nature of the previous activity differentiates it temporally. Ultimately excitation in a pool of neurones is dependent upon everything which is taking place in the nervous system anywhere, because of the direct or indirect representation of this activity in the population of endings in the pool. It is for this reason that a part of the system in isolation has lost some of the plasticity of behavior which it possesses in its normal relations.

The laws describing the mode of transmission of excitation across a synapse thus must be the basic laws of the

nervous system. What happens at the synapse must be determined by the qualities of the tissues which meet at that point, by the qualities of the terminals of the axon on the one hand, and by the qualities of the cell bodies and dendrites on the other. Of these two, only our knowledge of axons is at all extensive,—this because of studies made on peripheral nerve.

Two decades ago Keith Lucas<sup>20</sup> proposed the hypothesis that the phenomena taking place in the central nervous system could be explained without the assumption of any properties which could not be experimentally identified in peripheral nerve. On account of the untimely death of its author, this bold hypothesis was left to his successors without adequate support. Lucas' adherents defended it for a time, but in recent years the opinion of many observers has turned away from it.

The reason for the failure of the hypothesis is not far to seek. It does not lie in Lucas' employment of the now discredited notion of conduction with a decrement, but rather in the fact that the knowledge of peripheral nerve was so meagre that it supplied but little material with which to work. The known facts had to be used in the interpretation of the hypothesis in so fanciful a manner that the result could not be accepted. When one pauses to think that the reactions of the central nervous system are very labile and continue for considerable periods of time, it is easy to realize how difficult it would be to explain them in terms of events obeying the law of all-or-nothing and lasting less than one-thousandth of a second.

If the reactions in the central nervous system are to be explained on the basis of occurrences in peripheral nerves—if nervous tissue as it appears in peripheral nerve is to be made representative of nervous tissue in general—it is evident that the starting point of all discussions must be a thorough-going understanding of the physiology of nerve fibers.

As many as have been the studies made of peripheral nerve, much still remains to be done. Previously unus-

pected qualities are continually being brought to light, but already enough information about nerve has accumulated to permit the beginning of a composite picture of nervous tissue

Ten years ago the term "action potential" referred to only one process, that which is represented by what is now called the spike potential. At the present time we must recognize that activity is not characterized by the spike alone, but that it means the setting in train of a series of processes each of which reveals itself by a potential change. The latter are called after-potentials, and they, as well as the spikes, vary in the composite picture.

Velocity of conduction has already been mentioned as a variable. Where fibers are otherwise homogeneous, as in the first elevation of the action potential, the difference is based simply on the size of the fibers, the velocity varying linearly with the diameter of the fiber<sup>14</sup>. But between the first and the last elevation some other variable enters, probably the duration of the spike, as spikes last 0.4 msec in the fastest fibers and about 2.5 msec or even longer in the slowest.

Spikes may be characterized as the message carriers of the nervous system, both in the tracts of the brain and in peripheral nerves. As shown so clearly by Adrian and Bronk, the messages are carried by a succession of signals or spikes in the individual fibers. The signals are all alike, but differently spaced, and the interpretation of the message at the receiving end depends upon the pattern of fibers occupied and the frequency of the signals in the individual fibers. We shall see that the frequency of arrival of impulses has an important bearing on whether or not they can pass a synapse.

Following the sequence of spikes which carries the message—and even during its continuation under appropriate conditions—the after-potentials may be seen. They occur in their simplest form in a single response, appearing to rise out of the tail of the spike rather than being continuous with it. The potential generally is made up of

two parts, an initial, negative portion and a later, positive portion. In the fibers of fast conduction, under normal conditions, the negative portion is first seen at its maximal value. In its subsequent course (Fig 2) it subsides along a decremental curve for a period of about fifteen msec, and then gives way to the positive portion lasting about eighty msec.<sup>17</sup> A representative value for the degree of positivity at its maximum would be twenty-five  $\mu$ v, which would be equivalent to about 0.2 per cent of the potential of the spike crest. In C fibers (Fig 3) the positive after-potential is much larger in proportion to the size of the spike<sup>3</sup> and lasts up to one half second or more. It is preceded by a negative after-potential, but no statement can be made as yet concerning the dimensions of the latter under physiological conditions. The negative after-potential in appropriate records is visibly made up of a period of development followed by a period of decline, a property which can be demonstrated in the fast fibers only under special conditions.

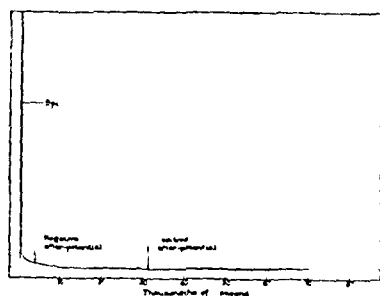


Figure 2

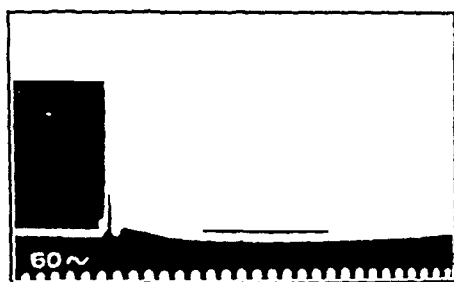


Figure 3

After-potentials stand in contrast to the spike with respect to their lability. The form of the spike is rigidly maintained through a wide variety of conditions, while the after-potentials change their form with every event that happens. Small changes in the concentration of hydrogen ions, or of the salt balance, are readily detectable and the potentials are differentially susceptible to asphyxia.<sup>2, 15, 20, 27, 34</sup> Tetani modify them greatly, an observation of no small importance in view of the fact that nerve messages are carried by a sequence of spikes. The principal effect

of a mild tetanus is to curtail the negative after potential and to increase the depth of the positive potential (Fig 4) After a more severe tetanus the positive after-potential is further increased in depth, without showing an increase in duration, until a maximum is reached, and it is succeeded by a second positive component which increases in duration in proportion to the severity of the tetanus (Fig 5) Durations of five minutes have been observed in isolated nerves (fast fibers) and of one minute in nerves receiving their natural perfusion of blood in the body<sup>17</sup> Thus it is no longer permissible to say that events of long duration are confined to the centers

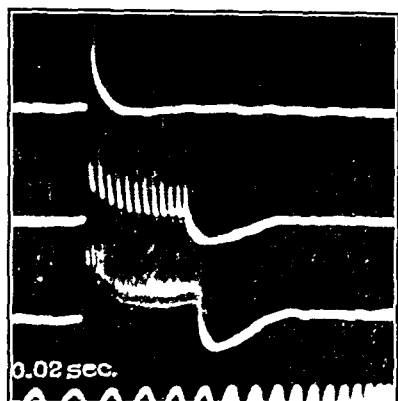


Figure 4

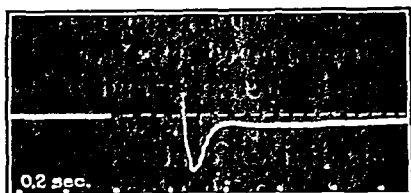


Figure 5

Undoubtedly one of the most significant facts that has come out of recent studies on nerve, from the standpoint of the application of peripheral nerve physiology to the centers, is the form of the recovery curve after excitation. It has been found that the refractory period of classical nerve physiology is succeeded by a period of deviation from normal excitability lasting as long as the after potentials. The recovery of the fibers of fastest conduction, as measured in the body after a single response (Fig 6), is characterized first by the refractory period (in which the fiber is at first wholly inexcitable, and later excitable only with stimuli of greater than normal intensity), then by a

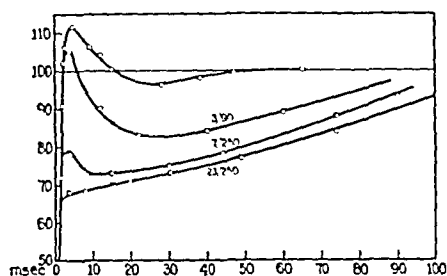


Figure 6

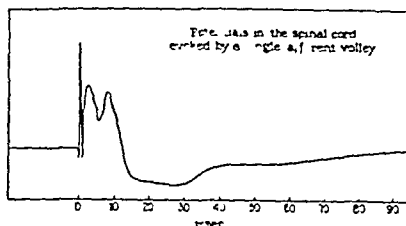


Figure 7

period of supernormal excitability lasting fifteen msec, and a period of subnormal excitability lasting eighty msec<sup>17</sup>. These periods in turn are related to the spike, the negative after-potential, and the positive after-potential. In other conditions the form of the excitability curve differs widely from that which has just been described, but in every instance the changes parallel the course of the after-potentials. For example, if the potential oscillates between negative and positive, as it does in tetany, the excitability oscillates with it, or if the positive potential is increased and prolonged, as after a tetanus, the subnormality likewise is increased and prolonged. If the spikes may be called the message carriers of the nervous system, the after-potentials in contrast may be called the indicators of the readiness with which messages will be accepted.

After this brief summary of the qualities of axons we are in a position to consider the extent to which these qualities represent the qualities of the parts of the neurone which enter into the formation of the synapse. Synapses are formed by contact of axon branches with the cell body or its dendrites. The axon branches may be expected to partake of the properties of the parent stem, but a question may be raised with respect to the cell bodies and dendrites, inasmuch as in their cytoplasm are found structures which are not present in axons. However, if the descriptions of these structures be reviewed, it is found that there are present only those structures which are generally found in cells, in other words, the structures which must be present if the normal vegetative functions of the neurone are to

go forward. Thus the histological picture does not provide a compelling reason for concluding that cells and axons are different in nature.

Grey matter and white matter are differentiated by their metabolic needs. Greater vascularity, greater oxygen consumption, and greater susceptibility to asphyxia are characteristic of the centers as opposed to the fibers. But here again the difference is not traceable to cells. Gomez and Pike<sup>19</sup> found that the dorsal root ganglia are not sensitive to anemia, Holmes<sup>24</sup> found that the metabolism is not high, and Dunning and Wolff<sup>6</sup> found that the vascularity is not great compared with peripheral nerve. Dorsal root ganglia are without synapses. In line with the suggestions of these authors, the high metabolism and high vascularity of the grey matter of the nervous system must be connected with the structure of the synaptic system. The strands of protoplasm which enter into the synapses are numerous and fine. According to current notions about the intimate structure of irritable tissues, conduction takes place along a delicately poised surface film which is maintained in repair only at the cost of a continuous expenditure of energy derived from oxidation. Removal of oxygen soon brings about loss of conduction even in peripheral nerve. It is to be expected, therefore,—in view of the fact that the area of the surface of a given volume of cytoplasm increases inversely to the diameter of the strands of which it is made up—that the metabolism in the fine strands of the neuropil would be higher than in the cell bodies or axons. In order to keep up the surface, a small strand must oxidize faster than a large one. Thereby it is made more dependent upon available oxygen and thus is caused to be the first to disintegrate when oxygen is removed. Support for this argument may be derived from the fact that the small nerve fibers, which are responsible for the second elevation of the action potential, are blocked by asphyxia before those in the first elevation.

In the end the question of whether cells and dendrites are different from axons must be settled by direct observa-



tion One method of examining them is to measure properties of the former and to compare the result with measurements of the same properties in the latter There are available two sets of measurements which are particularly useful for this purpose, both have been made by Lorente de N6<sup>28</sup> on the oculomotor nucleus

The first measurement is of the period of latent addition When a subthreshold impulse current of short duration is applied to a nerve fiber, for a brief period thereafter an effect is produced which permits a second impulse current, by itself ineffective, to bring excitation to threshold The time during which this summation of effects takes place is known as the period of latent addition In motor fibers it lasts about 0.2 msec To test this phenomenon at the synapse requires the bombardment of the nucleus with two volleys of impulses in two portions of the tract fibers When the two volleys arrive simultaneously, summation is at its best If they are separated by more than 0.2 msec, summation falls off rapidly, and it disappears almost entirely at separations of 0.4 msec Considering the difference in the testing mechanism of axon and neurone, the correspondence in the periods of latent addition of the two is very close indeed, much closer in fact than the periods of latent addition in different kinds of axons

The second measurement is of the absolutely refractory period, that is, of the interval during which a second response cannot be evoked by a stimulus of any kind, no matter how intense In motor fibers the period lasts from 0.4 to 0.5 msec Measurements previously made of the absolutely refractory period of neurones have been unsatisfactory, because a supermaximal stimulus is required for the testing, and excitation of neurones by way of their synapses is limited by the possible density of active terminals In the oculomotor-nucleus preparation, however, the necessary density of endings was found and the refractory period turned out to be 0.6 msec—a value so close to that holding for axons as to leave no doubt that the two are identical

Another aid to the comparison of neurones and axons is found in the potentials of internuncial neurones and

their behavior under various experimental conditions. Surprising as it may appear at first sight, electrical studies of the grey matter of the spinal cord are capable of yielding valuable information about its activity, despite the unfavorable situation presented by the intertwining in all directions of the numerous fine strands of the neuropil. The same characteristic, basic potential picture is obtained with great regularity,<sup>16, 25</sup> and the variations found are only those which are to be anticipated from the extent of the connections with other parts of the brain stem permitted by the conditions of the experiment, and from the state of the preparation. The differences may be accounted for largely on the basis of the extent of spread which is possible into the delay paths of Forbes<sup>11</sup> or the reverberatory arcs considered by Kubie<sup>26</sup> and by Ranson and Hinsey.<sup>33</sup>

When a single afferent volley enters the spinal cord (Fig 7), if gross leads from the surface of the cord are employed the first visible event is the spike potential in the continuation of the fibers in the dorsal columns. Following this potential and separated from it by the time consumed at the synapses, the potential in the internuncial neurones appears. The potential in the motor neurones is also detectable, but it makes a very small contribution to the potential recorded with the leads which are being described.

In its basic form the internuncial potential consists of two parts, an initial negative portion lasting about ten to twenty msec, and a later positive portion lasting 100 msec, but in its variations the potential differs widely from this form, there being a succession of other events lasting a second or longer. When the picture was first seen<sup>16</sup> it was difficult to interpret, as the necessary facts about mammalian nervous tissue were not known, and it became evident that the interpretation could not go forward until the missing information was supplied. Accordingly, the cord studies were suspended and a flank attack was substituted for a frontal advance. After the compo

site picture of the time course of the potentials in mammalian fibers began to take form it became increasingly clear that the internuncial potentials follow a similar course

The best interpretation that has been found is that the initial negative portion is made up of spikes temporally dispersed, and the ensuing positive portion of positive after-potential. The disproportion between the magnitudes of the two parts as compared with those in nerve fibers of rapid conduction can be accounted for by the much greater reducing effect of temporal dispersion upon the very short spikes than on the long after-potentials. It is also possible that the positive potential is large in the individual internuncial neurones, as it is in fibers of slow conduction

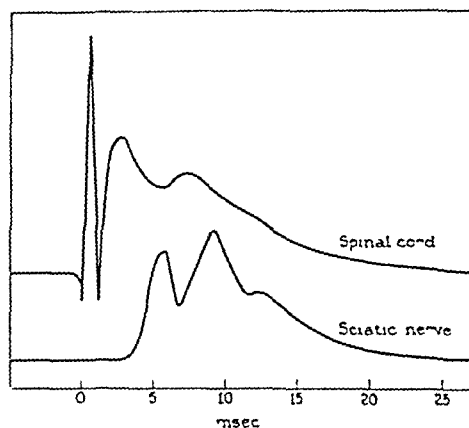


Figure 8

Additional evidence that the initial negative period is made up of spikes is found in its relation to the discharge of impulses by the motor neurones. The period of the discharge and the duration of the negative potential parallel each other (Fig 8). As the local excitatory effect in the motor neurones does not last longer than 0.5 msec,<sup>28</sup> the only way in which the succession of motor impulses could be kept up would be through excitation of the neurones in succession. This would mean that the motor neurone pool is being bombarded by spikes from the internuncial neurones throughout the time during which the potential of the latter is negative.

In the summary of the properties of axons it was mentioned that the excitability of the axon correlates with its potential. Correlation of potential and excitability must, therefore, be demonstrated in internuncial neurones if the hypothesis of similarity of the axon and the synaptic portions of the neurone is to hold. When the neurones are subjected to the test they pass it perfectly. They do not reach a state of responsiveness to a second afferent volley, equivalent to that obtaining in the equilibrated steady state, until all trace of positive potential residual from the first response has disappeared. The refractory period is followed by a subnormal interval (Figs 9, 10) without intervention of measurable supernormality, as would be expected from the absence of demonstrable negative after potential, and in keeping with the recovery curves of peripheral nerve conditioned by a short train of spikes (lowest curve, figure 6) instead of by a single one. (Occasionally supernormality is absent in peripheral nerve after a single conditioning action.)

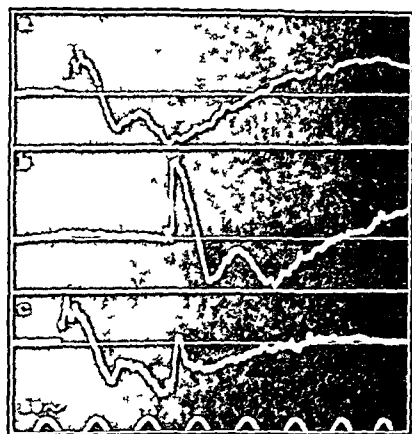


Figure 9

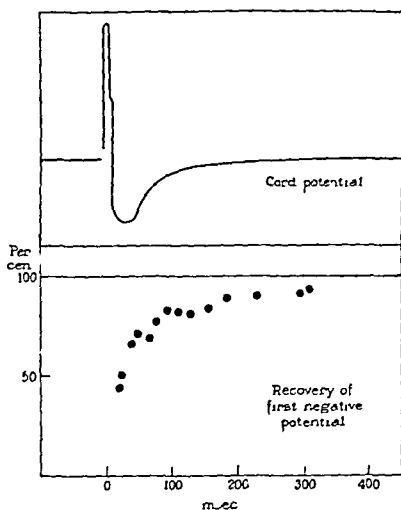


Figure 10

The correlation which occurs between the excitability of internuncial neurones and their potential throws new light on an old problem. We have seen that discharge of

the motor neurones is brought about by their bombardment with internuncial volleys during the period in which the internuncial potential is negative. From this observation it should follow that during the subnormal excitability of the internuncial neurones obtaining in the course of the positive potential, the failure of a calibrated afferent volley to evoke the full quota of negative potential (excited internuncial neurones) should result also in failure to bring about a normal reflex response. This is exactly what happens.

The relationships are brought out most vividly in experiments on the flexor reflex, in which a conditioning volley too weak to produce a motor response is followed by a testing volley sufficiently strong in isolation to produce a good contraction of the muscles.<sup>8, 25</sup> If the second volley falls during the period of negative internuncial potential of the first volley, it may be reinforced by the latter with a resultant facilitation of the reflex. On the other hand, if the separation is such that the second volley can no longer be facilitated, the size of the reflex will depend almost entirely on the amount of internuncial potential evoked by the second volley. Presumably because subnormality of the neurones excited by the first volley would prevent contribution of part of the excitation that would be necessary to bring into activity the larger pool of neurones which the larger testing volley would normally excite, the internuncial activity produced by the second volley may be very small and the reflex greatly reduced. In the language of the physiology of the central nervous system, the reflex would be inhibited.

Inhibition is a term of convenience used without exact definition in connection with a group of phenomena having certain qualities in common. The essential condition is the stoppage or prevention of action through the temporary operation of a process which does not harm the tissue. It is usually also implied that the process results from nervous activity, or imitates the results of nervous activity.

In the absence of an exact definition, current usage is the only guide to the employment of the term. Stoppage of the heart through the vagus is one of the most commonly cited instances of inhibition. But it is equally correct to say that the flexor reflex is inhibited by previous activity. Clearly, the term "inhibition" must apply to very different mechanisms. Inhibition of the heart is attributable to the intervention of a humoral substance, acetylcholine. The cardiac tissue is altered. Inhibition of the flexor reflex is caused by the high threshold of the internuncial neurones. The so called "inhibited" motor neurone is unaltered, it simply has failed to be excited. It is improper, therefore, to speak in terms implying that there is a general explanation of inhibition. One can only describe mechanisms which would be included in that category.

The large number and the diversity of the theories about the nature of inhibition in the nervous system may be taken as a measure of the obscurity which has surrounded the subject. Some of the theories are hardly more than restatements in other terms of the fact that the neurones are inhibited. Others are fabricated in analogy with conditions making for unresponsiveness in other situations. A humoral agent is often postulated, but no such agent has been found, nor is there any evidence for two kinds of fibers, excitatory and inhibitory, nor for two types of endings of one type of fiber. The Wedensky mechanism and anodal polarization are also not infrequently mentioned. In every instance the suggestions can neither be accepted nor rejected.

The subnormal period of responsiveness but recently discovered in nerve by H. T. Graham,<sup>21</sup> thus stands in contrast with the other possible explanations of inhibition which have been suggested, in that it has been found to be experimentally applicable to the cases of inhibition in which it has been tried. Descriptions of the phenomena connected with inhibition elsewhere also indicate that there are many other situations in which it will fit. We have seen how the flexor reflex is inhibited when the internuncial neurones fail to respond as the result of an induced high

threshold We shall now see that failure to respond can also occur because of a raised threshold of the motor neurone itself. Following a tendon jerk, such as the knee-jerk, the background excitation of the muscle stops for a time equivalent to the subnormal period of a motor fiber. This interval is known as the silent period<sup>23</sup>. The same phenomenon can be produced by exciting the motor neurone antidromically through its axon<sup>7</sup>. The latter experiment shows that antidromic excitation passes back over the neurone as far as the synapses, that the synaptic region of the neurone has the same period of subnormality as the fiber, and that while the raised threshold is in progress, the neurone cannot be excited by the impinging volleys from the internuncial neurones. It shows furthermore that the subnormality of the motor neurone, after its occupation by the reflex, is all that is necessary to explain the silent period. Very probably, however, the reflex is also followed by a decreased bombardment of the motor neurones during this period, because of the subnormality which would be produced at the same time in the internuncial neurones, owing to the spread of excitation over them from the stretch afferent fibers.

The general properties of inhibition are well known from the classic experiments of the Oxford school, carried out under the leadership of Sir Charles Sherrington. Inhibition appears at various intensities, it accumulates by summation of the effects of a succession of afferent volleys, it lasts 0.1 sec. or longer, and its subsidence follows a typical curve of decay. In these respects its behavior follows exactly that of the subnormal period of peripheral nerve, for in the latter the intensity and duration also depend upon the number of impulses which produces it, beginning with about 0.1 sec. for a single response. Accumulation of subnormality in nerve is attended by augmentation and prolongation of the positive after-potential. In this connection some fragmentary observations on the internuncial neurones of the cord are of interest, in these a tetanus was succeeded by a prolonged positive potential and diminished responsiveness.

Inhibition is usually described as being pitted against excitation, the description being based on the fact that an inhibited activity may be reinstated by intensifying the exciting afferent volleys. This again is what would be expected from the properties of the subnormal period. Subnormality is a matter of thresholds only, if excitation is brought to the limen, a full sized response is obtained. Thus a neurone with raised threshold would be induced to respond if more active endings were brought to play upon it, or if successive volleys could be made to arrive during the period of latent addition. Then, with the neurone restored to the performance of its proper function in the chain, the reaction in which it takes part would be reinstated.

No mechanism for bringing about inhibition can have very wide application, however, unless it will account for reciprocal innervation—the fact that when one muscle contracts, its antagonist relaxes. This case is the most difficult of all to explain. Its consideration demands taking into account both the nature of the neurone linkages and the effect of the timing of impulses.

The *timing* of impulses is an aspect of nervous activity which has received little attention, although it is in all probability of great importance. It may indeed be the occasion for the numerous velocities of conduction in nerve trunks which were mentioned previously and for which no satisfactory explanation has as yet been found. Their purpose may be to insure the arrival of impulses at the secondary neurones in the proper time relations. Let us consider some peripheral event, like an injury to the foot. The first report would come to the spinal cord in about thirteen msec, two msec later impulses would be on their way out over the motor nerves, and only ten msec later (on the basis of data obtained in animal experiments) would the first impulses arrive at the brain at the level of the medulla. In the meantime, impulses would be approaching the cord over some of the more slowly conducting lines. The first of the impulses capable of arousing a sen-



sation of pain would require forty msec to reach the cord, and the sensation itself would be felt only after half a second (Piéron)<sup>31</sup> Even at that time, however, the first impulses over the slowest fibers would not yet have reached the cord. The fastest impulses in the slow pain system would require three-quarters of a second, and the slowest about a second and a half.

These figures give some idea of how impulses starting simultaneously from a common point become separated. Electrical records from the cord show that the first impulses to arrive produce a large amount of activity,<sup>30</sup> and this activity has a marked effect on the subsequent course of the excitability of the cord neurones. It is quite possible that the function of the impulses which run on ahead of the others is to adjust the excitability of the synapses in preparation for the arrival of the later impulses. By carrying the idea of timing one step further it is possible to account for reciprocal innervation in terms of the known properties of nervous tissue.

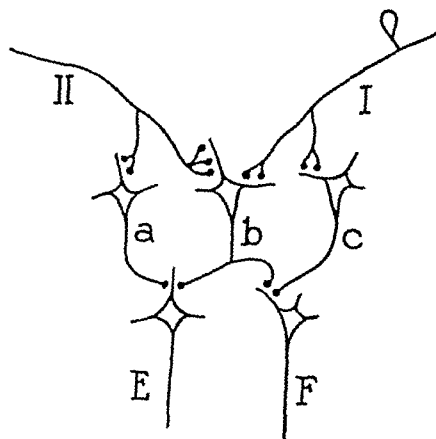


Figure 11

In the accompanying schema (Fig 11) the linkages are hypothetical, but drawn in accord with the known facts. Excitation at the synapses is widely held to be proportional to the number of active endings, and this view is followed in the interpretation of the schema. For the sake of the

argument, the minimal number of endings which must be active for excitation to occur is arbitrarily taken to be two. Use is then made of the fact that the period of latent addition is not over 0.5 msec, and that subnormality increases with the number of responses.

If a neurone *b* common to two pathways be switched out of one pathway when it is taken up by another, the necessary condition for reciprocal innervation would be fulfilled. Let us suppose that rhythmic stimulation of fiber *I* is maintaining a flexor reflex. Neurones *b* and *c* are excited, and their discharges arriving synchronously at *F* cause it to respond. Then let us suppose that in the course of this response an extensor reflex is set up through stimulation of fiber *II*. The latter can excite *b* in the intervals between the responses to *I*, because of the stronger excitation which it is able to deliver through its three endings. No discharges can result therefrom in *F*, as the impulses in *b* are out of time with those in *c*, and *I* is no longer able to excite *b* and *c* in unison, because of the raised threshold of the former. Neurone *b* is dominated by fiber *II*. Its discharges are caused to be synchronous with those in *a* instead of with those in *c*, and activity begins in *E*. Thus, when innervation of the extensor muscles starts it must be withdrawn from the flexor muscles.

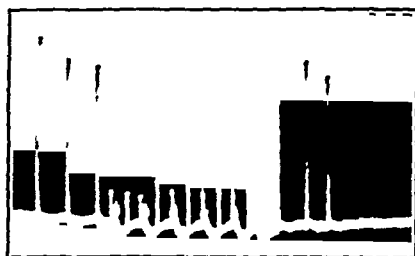


Figure 12

The taking over of a neurone by intercurrent stimulation may be imitated on peripheral nerve. Figure 12 shows the responses of the phrenic nerve to weak shocks at twenty per second. Intercurrent stimulation of the nerve with

stronger shocks at the same frequency causes most of the fibers which had been responding to the original series to fail to do so

Notwithstanding the fact that inhibition may include other processes as well as that described, and that the explanation of reciprocal innervation must be taken only as illustrative of how subnormality may be applied to the problem, the value of utilizing the properties of axons in the interpretation of the physiology of the centers is, I think, apparent. The applications of other properties await development. In order to indicate that there are

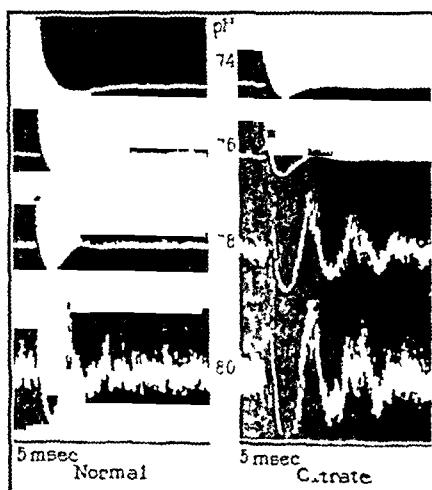


Figure 13

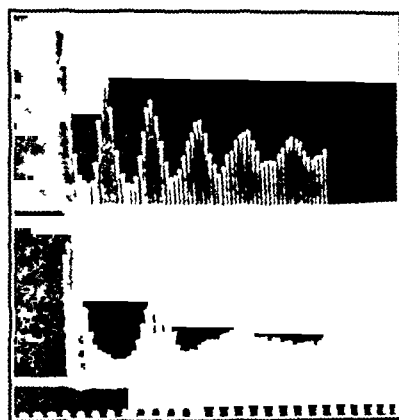


Figure 14

other possibilities, I shall mention in conclusion the representation in peripheral nerve of a property which is often considered as though it were exclusively central—namely rhythmicity

There are at least two rhythms in nerve, but the most obvious rhythm is the oscillation in the after-potentials. Following a single response of a mammalian fiber at the normal reaction of the body, oscillation of the after-potential is not readily made out, and it becomes rapidly attenuated, but if the nerve be made alkaline, or if it be deprived of calcium (Fig. 13), or asphyxiated, the oscilla-

tion becomes obvious, its period shortens, and it passes through a number of cycles before it is lost to view <sup>27</sup>

Nerves so treated are in tetany and subject to spontaneous firing of their constituent fibers, but the intensity of the firing varies with the changes in excitability. During the subnormal periods at the troughs of the waves the firing is decreased, or one may say inhibited. And during the supernormal periods at the crests of the waves the firing is augmented or facilitated. It was records like these which prompted my suggestion two years ago that there is an analogy between the first subnormal period and the silent period of motor neurones following a knee-jerk, and a possible relationship between the second supernormal period and the rebound discharge that follows the silent period <sup>12</sup>

Although rhythm is not obvious in the after-potential at normal reaction, it becomes very clear when the nerve is excited with a train of shocks from a thyatron adjusted to stimulate only a group of the most irritable fibers (Fig 14). The initial responses condition the fibers involved, and during the ensuing subnormal period the fibers drop out in relation to the narrowness of the margin between their resting thresholds and the shock strength employed. In the rebound they appear again and help to keep up the cycle, but eventually secondary events equilibrate all fibers to a common excitability. If the responses were sufficiently asynchronous, they would not be seen individually, and all that would be visible would be the envelope of the crests of the waves. The latter would then appear like the waves which are recorded from the spontaneously active nervous system. Different as are the conditions in the two cases, the nerve analogy serves to show how neurones which are subject to reexcitation in closed circuits would fall into a rhythm of response dependent upon their own natural period of excitability.

Nerve fibers have been studied for years, while the mechanics of the nervous system is almost an untried field. If I have given too little time to recounting the accumu-

lated facts about the physiology of fibers and spent too much time in looking over the fence into the new field, it is because this lecture has been motivated by the idea that for the understanding of the nervous system it is better, before turning to postulates, to look to peripheral nerve for what it has to offer of suggestions and explanations

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## FIGURES

Fig 1 Action potential of the saphenous nerve The nerve is mounted in serum equilibrated with 5 per cent of  $O_2$  in  $CO_2$   $37^\circ C$  Conduction distance 41 mm The upper record shows the elevations produced by the faster fibers The lower record shows the C fibers They appear on the positive after-potentials of the fast fibers, the spikes of which are bunched near the break in the line Although the distal lead is from killed nerve, the C elevation is recorded from both leads and hence is repeated in an inverted position

Fig 2 Diagram of the potentials in a mammalian nerve fiber in their normal relationship in a single response

Fig 3 Potentials in C fibers, splenic nerve of the cat The spike elevation, which has a secondary group in its falling phase, is succeeded by a negative after-potential (from which it is separated by a notch known as the diphasic artifact) and a long positive after-potential Isolated nerve at  $37^\circ C$

Fig 4 Alterations produced in the after-potentials in a phrenic nerve by short tetani a) single response, b) tetanus at 180 per second, c) tetanus at 350 per second  $37^\circ C$  Time, 20 msec

Fig 5 After-potentials in a phrenic nerve after a longer tetanus The tetanus starts at the break in the line, the spikes go far beyond the record The potential is first visible as the negative after-potential and is continued by the positive after-potential in two parts (Gasser and Grundfest)

Fig 6 Excitability curves of the saphenous nerve of the cat *in situ* Ordinates Excitability in terms of resting thresholds (reciprocals of shock strength) Abscissae Separation of conditioning and testing shocks The upper curve is conditioned by a single shock, the other curves are conditioned by tetani as indicated, e g 3/90 means three shocks at ninety per sec (Gasser and Grundfest)

Fig 7 Potentials in the spinal cord evoked by a single afferent volley

Fig 8 Relation of the reflex discharge into the sciatic nerve to the internuncial potential in the lumbar cord of the cat (Spinal preparation) (Drawn from Hughes and Gasser)

Fig 9 The effect of previous activity on the responsiveness of internuncial neurones in the spinal cord of the cat a) Response to a submaximal volley from the tibial nerve b) Response to a volley from the saphenous nerve c) The two volleys in succession Note the decreased response to the volley from the saphenous nerve and the effect of the latter on the late part of the response to the tibial volley Spinal preparation Concentric needle electrodes in unexposed cord

Fig 10 Size of response of internuncial neurones in relation to the potential evoked by a conditioning volley Conditioning and testing shocks of the same size and applied to a sensory root (Drawn from Hughes and Gasser)

Fig 11 Schema illustrating reciprocal innervation

Fig 12 Effect of a dominating train of stimuli on the rhythm of response of a phrenic nerve Stimuli of near-threshold strength are applied at a frequency of twenty per second through one pair of electrodes, and midway between the responses another train of the same frequency is started with stronger shocks at electrodes further removed from the leads The larger responses to the latter are seen as faint lines followed by positive after-potentials During the intercurrent tetanus most of the fibers accessible to the first train are taken over into the rhythm of the intercurrent train

Fig 13 Accentuation of the rhythm of the after-potentials in the phrenic nerve by increased alkalinity and by deionization of calcium The first column shows the effect of altering the hydrogen ion concentration alone, the second column the behavior at the same pH values 80 minutes after exposing the nerve to the same saline with citrate added The spikes occur at the first breaks in the lines and are not visible When the alkalinity is high, spontaneous firing of the fibers occurs 37° C Conduction distance, 4.5 cm (Lehmann)

Fig 14 Rhythmic response of the phrenic nerve of the cat to a train of shocks of constant strength selected to include the low threshold fibers only The upper curve differs from the lower in that the nerve is more alkaline The two rhythms are rapidly interchangeable Time, sixty cycles Frequency of stimulation, 220 per sec 37° C

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## RABELAIS AS A PHYSICIAN\*

FREDERICK T. VAN BELLEN, JR.

If he had been nothing but a physician it would be relatively simple to make yourself a mental picture of Maître François Rabelais, Docteur en Médecine, Université de Montpellier. In his silken robe and many cornered hat, his staff and gloves at hand, he sits in his high-backed consulting room chair and looks seriously at his uneasy patient "Dommage", You can hear him say, "C'est dommage Alois, est ce que vous avez le pisse chaud?" You can see the amused quirk of his lips, nearly hidden by the thick moustache, and, at first perhaps a trifle offended, you suddenly catch the look of grave sympathy in his keen, dark eyes. A feeling of comfort flows into you again with a conviction of his knowledge, his kindness and his honesty. Will you not affirm, with his other patients, "Un de ces hommes les plus charmants."

Can you not feel the knowledge of humanity as well as of books in this man who, speaking of earlier medical writers, said in his dedicatory epistle to Book IV, "Above all, the aforementioned authors have had special advice to give the Physician concerning the words, remarks, discourse and conversation which should take place between him and the patients by whom he is summoned, the object being that all should tend to one end, namely, the cheering of the patient (without any offence to God) and the avoidance of anything that may, in the least, serve to make him sad."

Can you not feel the genial kindness in him from his little prologue to the story of his fabulous Giant Gargantua

*"My friends who are about to read this Book  
Please rid yourselves of every predilection,  
You'll find no scandal, if you do not look,  
For it contains no evil or infection  
True you'll discover, upon close inspection,  
It teaches little except how to laugh  
The best of arguments, the rest is chaff,  
Viewing the grief that threatens your brief span,  
For smiles, not tears, make the better autograph,  
Because to laugh is natural to man"*

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Yes! if he had been nothing but a physician, it would be easy to make a simple, pleasant picture of this kindly soul, for he believed that Nature was right and that the thing to do was to obey her and follow her. But Rabelais was so much more than a Physician. He was a living, active, energetic fragment of that complicated, fascinating period of time, the so called Renaissance of which we hear so much and of which we really know so little.

The Renaissance was his background and his milieu and we have to look at his figure against it and within its confines. It was a marvelous period and a period of marvels. Miracles were still occurring and were still believed in. Alchemists flourished, astrologers thrived and prognosticators blossomed everywhere. So little comparatively was actually known that you could believe almost anything you wanted to believe. Ignorance was so general that the imagination had freer play than in these days of knowledge and proof. Yet there was science of a sort, and above all there were literature and art. The two latter were fostered to some degree by the church but science was looked upon somewhat askance as a probable enemy of authoritarianism. The dark, destructive five centuries of barbarian domination over the civilized world were past and forgotten, but the domination of the Ecclesiastical Powers, which would seem just as barbarous to us, had replaced it in the eleventh century, and as late as the fifteenth century, lay like a heavy shadow across the path of progress.

Already this shadow was beginning to be lifted. Relieved of the necessity of fighting for mere existence, men had begun to fight for the right to think for themselves. Within the Church, which had grown into a sort of super-state claiming sovereignty over the states of Europe, Luther and Calvin had aroused a storm of criticism against the corruption and abuses of established authority. The storm they aroused scathed Luther and destroyed Calvin but from it grew the Reformation which split the Church wide open and eventually sapped its power.

Outside the clerical body of the Church itself, kings as well as common men had begun to rebel against its iron domination. Henry of England, enamored of Anne Boleyn, was getting up his courage to dispense with its withheld permission to divorce Catherine of Aragon. Rabelais was satirizing the ignorance and oppression which he appreciated the better because of his own bitter experiences.

The latter half of the fifteenth century may be likened to none other so well as that in which we live, for it produced three prime inventions or discoveries which destroyed the Past and transformed the Future. Those agencies were the printing press, gunpowder and the mariner's compass. Gunpowder had nearly completed the destruction of the Age of Chivalry, the printing press had begun to enlighten the dark Age of Ignorance, and the mariner's compass was slowly strangling the Age of Romance. That heritage of Chivalry, the almost utter feudal dependence of the small upon the great, still hung over the countries of Europe, and Rabelais, as we shall see, must have his Patron, du Bellay, just as the fortunes of du Bellay hung upon the King.

It was a time when the hardihood of men's religious beliefs was legally tested by blazing faggots and the rack. It was a time of restlessness and insecurity of mind as well as of body and of fortune, a time as desperately unsettled and with its unsettlements as ill understood as they are today. One might, as du Bellay, be a Cardinal at sixteen, a King's envoy full of honors and esteem at forty, and a crippled and discredited refugee at fifty, dying of gout in an obscure hill village on the way home from virtual banishment. One might, as Martin Luther, be a blazing firebrand of enthusiastic Reform at one moment and, at another, be destroyed by the back-fires one's own revolt had ignited. One might, as Rabelais, be hailed one year as "the honor and sure glory of the healing art", and a very few years later, be forced to flee the country before the implacable enmity of the Faculté de Théologie of the dreadful Sorbonne. It was a world whose many sides and aspects, seen through the perspective of four hundred years induce

kaleidoscopic confusion in the modern mind and obliterate one brilliant picture by another in the wearying imagination

Through it all, the lamp of learning began to burn brighter and more strongly with the stored up fuel of ancient wisdom wisdom brought from Byzantium, after its fall in the middle of the Fifteenth Century Contrasted with the intellectual poverty of the darker ages gone before, here was a feast of reason, and the brain-hungry brethren of the early Renaissance fell avidly upon these precious documents and devoured them greedily

This group of scholars, because they were devoted to these litterae humaniores, called themselves Humanists and bathed luxuriously in the springs of Greek and Latin origin Amusingly enough, because these ancient sources were but newly rediscovered, they termed the profitable study of them the New Enlightenment The Humanists prided themselves no little on the superiority of their new-old learning to the rigidly prescribed limitations of that scholasticism from which they had just declared their freedom

Among these newly enlightened Humanists we find François Rabelais, a man of spiritual substance in learned circles He reads Greek and Latin, he translates one into the other and both into his native French He knows and is known by Erasmus and Budé, perhaps the greatest scholars of the day, and is a friend of Tiragueau and Bouchard He admires, and later flouts Luther and Calvin He tears off his monkish garb and studies Medicine He writes new Translations of Hippocrates and Galen which excite the applause of his learned colleagues He follows these with fabulous story books which bring him eventually undying fame, but, meanwhile, the unquenchable enthusiasm of the people and the implacable enmity of the orthodox Church He secures the patronage of the du Bellays and the favor of the King He attends hospital, is present at the meeting of rival Kings, flees from the threats of the Sorbonne, visits the Papal Court, flits about like a shadow, ceaselessly restless, insatiably curious, in-

curably cheerful in the face of difficulties and disappointments. He secures the Pope's absolution for his apostasy to church rules and for his extraordinarily informal doffing of the monkish robe for the Doctor's gown. He receives two livings from the church and, two years later, is forced to resign them. He died in 1553, no one now knows how nor where.

One can not truly see Rabelais as a physician who has not followed him through his long preparation for a liberal science and art through the narrower fields of theology and law.

Born near the end of the Fifteenth Century, of a country family in comfortable circumstances, he was apparently entered in a monastic school at the age of nine. There he remained some twenty years, acquiring a very thorough knowledge of Latin and Greek, in spite of the efforts of the Franciscan Friars to prevent it—efforts for which he cordially despised them. Later his transfer to the kinder, more enlightened order of the Benedictines, relieved him of the necessity literally to fight for his learning. But in 1524, about the age of thirty, he doffed his monkish habit and set forth upon his restless way through life.

He probably studied law at Bourges and Orleans, during the next two or three years, for his books evidence a considerable knowledge of common law, as well as canon law. But he must have been disgusted with its injustices, its dishonesties and delays, for he seems to have gone to Paris in 1528 and remained for two years, probably engaged in medical studies. I say probably because no one really knows. But it is known that at Montpellier, where he matriculated for the M. B. degree in 1530, the requirements were three years of medical study based upon a thorough prerequisite of logic and philosophy. Yet, as we find that the Bachelor's degree was conferred upon him barely six weeks after his matriculation he must have completed his medical requirements elsewhere.

At Montpellier then he paid his matriculation fee of one golden crown and wrote in the Register, "I, François Rabelais, of Chinon, diocese of Tours, enter myself for the

purpose of studying medicine and choose for my Preceptor the illustrious master, Jean Schyron, doctor and regent in this University I promise to observe all the rules of the said faculty of Medicine which are ordinarily kept by those who have in good faith given their name and solemn promise, according to custom, and, under this, I have signed with my own hand This seventeenth of September in the Year of our Lord 1530 "

Medicine was something of a fad among the Humanist group who considered it a branch of Philosophy, and doubtless Rabelais was better prepared than most students by his long previous training in the Humanities and his thorough knowledge of Greek and Latin At any rate, the date, December 1, 1530, finds him paying another golden crown as fee and having the degree *Bachelier en Médecine* conferred upon him

Part of the post hoc requirement for this degree was the "Petit Ordinaire", a three month's course of lectures to be given by the newly fledged Bachelier Rabelais chose the "Aphorisms" of Hippocrates and the "Ars Parva" of Galen as his subject Either because he desired to present a novelty, or perhaps to exhibit his unusual erudition, he lectured from the Greek texts instead of employing the usual Latin translations This rather revolutionary plan succeeded, we are told, in securing excellent audiences, for novelty was as attractive then as now

You can imagine the bitterness he felt against the early restraints of his monkish education, a bitterness which caused him to discard its outward symbol of the robe You can equally imagine his delight in the freedom of a study where a critical attitude of mind had already begun to be encouraged He expanded in this new freedom and entered with some zest into the enjoyments of his colleagues

These, at Montpellier, consisted principally of banquets and theatricals His account of one performance, in which Saporta, the Professor of Medicine and Chancellor of the University, and Tollet, another contemporary light of the profession, also took part, is clear and so direct as to sug-

gest that Rabelais may have written it himself or have adapted it from the Latin of Terence and the popular French of a *Pathelin faice*. At any rate he named it "The Moral Comedy of One who has married a Woman who is Dumb."

His course of lectures ran through the late Spring of 1531 and, having completed them, he vanished from Montpellier without any record of having made an effort to qualify as Licentiate or Doctor of Medicine. One has to surmise the reason why he thus broke off his course of studies. His was a restless soul and perhaps he could not contemplate with equanimity the necessary tedium without change of occupation. The requirements for Licentiate were four tests, sustaining four successive theses on subjects assigned the night before. Each disputation lasted one hour. Then, after eight days, two more theses, the first having to do with some specific disease, the second with the Aphorisms of Hippocrates. The disease or aphorism was selected by lot from a book held, in the one instance by the Chancellor, in the other by the Dean. These disputations likewise lasted four hours each. One can readily imagine a man who has just completed a three months course of lectures from a Greek text shrinking slightly from such a prescribed continuation. Perhaps he had provisioned the Antioch Plan and desired to put his knowledge to the test of practice, for it was one of his contentions that a physician should constantly check his book learning by his experience, a rather novel doctrine at that time. The more reasonable explanation is that he needed money for those golden crowns the fees demanded.

Whatever the reason, after a banquet, on October 9, 1531, he disappears from Montpellier and reappears in Lyons, the City of Printers, in 1532. Late in the Fall of that same year, he is appointed physician of l'Hotel Dieu, at an annual recompense of fifty livres. This salary was of importance because, still a lay brother of the church, he was not allowed to charge for his medical services. Thus in a way he was an early forerunner of the presently popular "Full Time Man." He appeared, too, divided in his mind

between two doctrines, the then all-powerful authority of the Ancients (one even swore by Hippocrates) and the study of Nature, to which his own insatiable curiosity much inclined him. Following the latter urge, he made "An Anatomy", as it was called, a dissection of the human body, at the Hotel Dieu, in spite of this practice being condemned by the Church, repudiated by custom and scarcely approved by learned men.

Although in Italy dissections had been freely made for about two hundred years, they were still rare in France, only four a year being allowed in Paris and one a year at Montpellier. It was before Vesalius had begun to hunt cadavers beneath the gibbets and in the cemeteries. Only one criminal per annum was allotted to the Anatomist of Lyons. So rare indeed was this privilege that records were kept of them in the University Archives.

This particular dissection by Rabelais was celebrated in excellent Latin verse by his printer-poet friend and admirer, Étienne Dolet. His verse makes the very corpse gloat over the honor of being dismembered by the illustrious Maître François Rabelais, in these words: "Strangled by the fatal noose, I hung miserably impotent. Then unhopèd for good luck arrivèd such as I would scarcely have dared beg the mighty Jupiter for. Behold me now, being dissected by the most learned of physicians, who is about to admire, in the machine of my body, the incomparable order, the sublime beauty of the human body, the greatest work of the Creator. The crowd looks on attentively—what signal honor and what excess of glory for me! And to think that I was to have been the plaything of winds, the prey of rapacious crows! Ah! Destiny can hardly harm me now. I bathe in glory!"

In spite of this excellent beginning Rabelais, dividing his time between the hospital and the Printery of Sebastian Gryph, began to give too much time to the latter. He absented himself from the hospital several times without leave and for that mistake was speedily replaced. His salary gone, he must then apply himself in earnest to his bookmaking.

The year 1532 must have been a painfully busy time for Maître François. There, in Lyons, and in that one year, he brought out no less than four publications. On June 31d, his translations of the "Epistolae Medicinales" of Manardus, appeared, dedicated to the learned Judge Tragueau. A translation of the "Aphorisms" of Hippocrates came forth on July 15th, dedicated to the very liberal Bishop Geoffrey d'Estresac, to whom Rabelais was deeply indebted. And, on that same date, came a translation of the "Ars Parva" of Galen, dedicated to those Third and Fourth Estates of Medicine, the Surgeons of the Long Robe and the Barber Surgeons.

To them he wrote, "And as for Surgery (which is after all but manual work) the Doctors esteem it a thing too low and quite unworthy of their profession, and not alone the labor of it (which Hippocrates and Galen were not ashamed to practice) but even the method of curing ulcers and unnatural tumors are held by them to be derogatory to their dignity. It follows that the Barbers and the Surgeons are today more studious than any Doctors. And this is the reason I have translated from Latin into French the Fourth Book of the method of Galen, because of the great and eager desire that I have recognized among said Surgeons to understand such things."

These publications, in addition to proof reading and editing the manuscripts of others, would provide a sufficiency for one man, but Rabelais was indefatigable, and besides, needed money. Greek translations, like learned books of today, brought much honor but little cash.

He had noted, perhaps earlier but certainly in the early part of 1532, the enormous success of an extraordinary, though perhaps rather dull tale of a fabulous personage entitled, "Les Grands et Inestimables Croniques des Grands et Enorme Geant Gaigantua." It is quite possible he had read proof on this and edited it. Even so, he observed its success, for it sold at the spring fairs in Frankfort and Lyons, where books were principally marketed, "more copies than had been sold of Bibles in the preceding nine years."



paintings on church windows the angel's message is represented as a ray of light penetrating the Virgin's left ear. Sometimes the tiny image of a child is shown in the ray. This legend is found also in the hymn of St. Ephrem

*"Gaude, virgo, mater Christi  
Quae per aurem concepisti,  
Gabriele nuntio"*

But the miraculous birth of Gargantua was not only a satire on this curious legend, it was also the vehicle by which Rabelais could export his anatomical and obstetrical learning outside the narrow limits of the class room. Rabelais gives a very vivid description of the difficulties of labor omitting no humorous particulars and then, calling upon his imagination equally as upon his knowledge of anatomy, he boldly proceeds to the climax of this almost virgin birth.

"Unable to find release from the embraces of the womb, the infant turned a somersault, entered the vena cava inferior and, passing by the diaphragm, ascended to the level of the shoulders where this vein divides. There taking his way to the left, he emerged from his mother's left ear." Even in satire he is consistent in specifying the same portal for the entrance of the seed and the exit of the fruit.

Rabelais here not only ridicules the ignorance of the mid-wives in his day and laughs at the commonly current stories of miraculous birth but a little later on satirizes the superstitious beliefs which, at that time, attributed special significance to the first cry of the new born. "For," the author declares "the instant he was born he did not cry, like other infants, 'miaow, miaow,' but shouted in a loud voice 'a drink, a drink,' as if he were inviting the whole world to drink."

Much of Rabelais' medical practice, like that of other physicians of the day was among patients with venereal disease. It is natural then to find him alluding frequently to carnal concupiscence, the frailty of women and the best means of reducing the former and circumscribing the latter in his second and third books.

His language was that of the day. It was no more gross than words used at times by John Calvin or Martin Luther from the pulpit. Friar Jean Raulin's "Sermon on Widowhood" is said to be racy reading even today. The language of such reverend fathers as Oliver Maillard and Jean Bourgeoise, even in the presence of royalty, makes the speech of Panurge seem almost restrained. The speech of that Century indeed alluded to the obvious physiological functions of the body with the same natural human zest in them as was brought to the burning of a heretic. It was symbolic of an age of Spring bursting the non restraints of an age of Winter, when the freedom of the Renaissance finally broke the dam with which the Middle Ages had tried to limit the flow of the river of life. It was therefore natural for commentators living in an age of greater restraint to represent Rabelais as a roysterer and libertine. Later researches into his life and times have changed the gaudy colors of that picture. No one now who knows how hard he worked, how truly devoted he was to learning and how much he was admired by the learned men of his own day, can fail to appreciate his greatness or to applaud the courage with which he satirized the abuses of the Church and the Courts.

It is perhaps a question whether Rabelais should be regarded primarily as a surgeon, an internist or a specialist in Public Health. At any rate he understood the fallacy of shutting off the chief branches from one another, for we find him writing in the preface to his translation of the XIII Book of Galen "Such books as the III to VI and XIII and XIV, are very necessary for Surgeons. As for the other six books they treat of abnormal temperatures, embracing fevers, or of the maladies that the Greek calls symptoms, particularly in the XII Book. For this reason we have omitted the translation of the said six books, considering that the contents are more suitable to physicians than to surgeons. I say more suitable. But, in spite of the Art of Medicine having been divided into three parts, one part cannot be separated from the others without detriment to the whole medical profession as we have very plainly shown in the commentary in the XIV Book—foi

the reason that the consideration and knowledge of fevers and the reverse are by no means unimportant to methodical surgeons”

In spite of the fact that he apparently invented an improvement on the glottocome of Hippocrates for traction in fractures and an improvement on the syringotome of Galen, which he adapted to cut the constricting band in strangulated hernia, Rabelais was not primarily a surgeon. Much of his fame as a practicing physician seems to have come from his treatment of venereal diseases, rife at that time throughout France.

Gonorrhea apparently interested him but little and he alludes to it only in one passage of his works, where he says, “it causes a burning piss which torments one more than he would think. But medicines relieve this very satisfactorily and, by means of drugs, mild purgatives and diuretics, we can cause the patient to piss without pain.” He then goes on to reflect bitterly about “the crowd of fool philosophers and physicians who lose time disputing about whence comes the heat of this water.”

It is interesting to observe that in relation to sexual disorders in women, Rabelais adopts the opinion of Plato who, in the *Timaeus*, refers to the uterus as a small, voracious animal, hungry for its prey, and believes that the starving of this little animal is fraught with dire results to its host—a concept that some psychiatrists seem not disinclined to follow in these times. At least Rabelais makes old Rondibilis adopt this idea, whether he himself really held it or not.

We cannot follow Rabelais on his visits to Italy where he served as personal physician to Cardinal du Bellay on his mission to the Papal Court, but doubtless he learned there a good deal about the treatment of Syphilis. So we are not surprised to find him, in 1547, a paid physician of the city of Metz whither he fled to avoid implication in the threat of heresy which had been laid against his friend, Etienne Dolet.

At the hospital of St Nicholas, where he worked, the patients were divided on admission into "les bons malades" and "les pauvres malades," the latter term denoting patients who had plague, leprosy or syphilis. These were assigned to Rabelais and he had also the duty of inspecting medically the public prostitutes. These had since the time of Louis XI been housed in "maisons closes" which were given the name of "boordeux" (hence "Bawdy" houses?) and were limited to special streets.

Syphilis was wide spread, even in high society and Rabelais comments upon it through his character Epistemon, describing what he has seen in Hell. "The Pope Sixtus," relates Epistemon, "was a grease of Syphilis." "What?" cries Pantagruel, "do they have Syphilis there?" "Certainly," answers Epistemon, "I don't know how many, but more than a hundred million of them. For, believe you me, those who don't have Syphilis in this world have it in the next."

Rabelais adopted the method of Torella with mercurial rubbings of one to forty mercury ointment, which others had found successful. Soon after the year 1500, Benegario da Cairi had made a great fortune by rubbing away Syphilis with mercurial ointment. Thierry de Hery, a barber surgeon who followed the Italian Army, wrote a book in 1537, enlarging Torella's descriptions. He was an enthusiast about the matter and frank withal about his reasons for it. To one who, seeing him kneel before the statue of Charles VIII, remonstrated that Charles was no saint, he replied, "Silence friend, I know well what I do. He is indeed a saint to me because he was the means of my earning 30,000 livres de rente because he brought Syphilis into France." And Rabelais doubtless knew and followed the work of Hery though not to the same gainful extent.

The growing enthusiasm for this form of treatment resulted in pitiful and grotesque excesses which Rabelais describes. "How often have we seen," he says, "at the time they are well anointed and greased at every point, their faces swollen and their teeth rattling loosely like the keys of a clavier or a spinet."

There is, unfortunately, practically no detailed knowledge of Rabelais' practice, but there is enough perhaps to indicate that he was a real Doctor and, in spite of his lapses into literature, deeply and sincerely interested in his work and in his patients

After the Sorbonne had banned his popular works, he complains piteously, "They have snatched them away from the sick, the gouty, the unfortunates for whom I had originally composed these books" And then he adds, somewhat grandiloquently, "For, if I could take under my personal care all who are sick and ailing, there would be no need for works such as mine" Later, he adds, "since then it is not possible for me to be called in by all the sick, or to take all patients under my care, how great a piece of spite work it is to want to deprive the ill and languishing ones of whatever amusement they may, without offense to God, the King, or any other, be able to find in listening to those merry books of mine, when those books are read to them in my absence"

Rabelais died a long time ago and he should not be judged only by what men of other centuries thought of him Let us for a moment look at some of the contemporary expressions of men who knew him Étienne Dolet wrote a poem celebrating a dinner given in his own honor on the occasion of his having received the King's pardon for a manslaughter which he had committed in self defense He names all the prominent guests and, of Rabelais, he says, "François Rabelais, the honor and sure glory of the healing art, who even from the gates of Pluto can recall the dead and restore them to the light" Salmon Macrin, a well known poet of the time, in a Latin ode of the same period addressed to "Rabelais, the Most Skilful Physician," writes, "Paris, Narbonne, the banks of the Aude and Lyons, where you make your home, are witnesses of your skill" And Boulanger, a learned Physician of Loudun, said in a Latin poem, printed twenty years after Rabelais' death, but evidently intended as an epitaph, "you will perhaps think the man a buffoon and a jester, one who angled for

dinners with witty speeches No! he was no buffoon, no jester of the market place, but one who, with the penetration of a distinguished mind, laughed at the human race, its foolish wishes, its credulous hopes Nor would you find any more learned, when it pleased him to lay aside laughter for serious topics If a great and difficult question had to be decided, you would have said that he and he alone saw into the greatest mysteries, that to him alone were revealed the secrets of Nature He was familiar with all the learning of Greece and Rome and, like a second Democritus, laughed at the idle fears and hopes of the populace and princes and at the vain cares and anxious labors of this transitory life "

By the Sorbonne he was of course looked upon as a menace and a blasphemer, but is that in itself not a compliment? Later and more accurate researches have brought forward a new Rabelais and one that you cannot help feeling is much nearer to the real man himself He was a man of brain, a man of spirit, a man of heart, rather than a creature furnished only with gullet, belly and genitals One may no longer think of Rabelais, the man or the physician, as a fat, greasy rascal with a prurient smile upon his face and a dirty word upon his lips On the contrary, he was a man of distinguished learning, a most courageous combatant against the evils of the government, the law and the church as well as against disease But above all Rabelais was a most human man

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1 OBSTETRICS AND GYNECOLOGY FROM THE  
PUBLIC HEALTH VIEWPOINT

JOHN L. RICE

*Commissioner of Health*

Attention was called to the large number of deaths charged to prematurity, and Chicago's plan for dealing with this situation was recommended to serve as an example for other cities. In connection with the large number of infant deaths now charged to injuries at birth,—Dr Rice presented figures showing that last year 22.2 per cent of the births in this city were delivered by some form of operative procedure and obstetricians were asked to consider (a) to what extent is operative interference justified, (b) was the type of operative interference the proper one, (c) was the operator qualified to undertake it. He made special reference to 23 per cent of cesarean deliveries and questioned whether this proportion was at all necessary. In speaking of deaths charged to asphyxia Dr Rice wondered whether twilight sleep had not been a factor in a significant number of such deaths. The obstetricians had some responsibility also for deaths reported as stillbirths, especially those occurring after completing thirty-five weeks of pregnancy. These, together with the live-born infants who died within the first week, amounted to 3815 deaths which, said Dr Rice, "presents a challenge" to the obstetricians. He reminded them also of 459 maternal deaths occurring in New York City during 1936.

The great havoc now caused by the venereal diseases was emphasized and cooperation with the Department of Health in its efforts to control these infections was asked. He also urged that obstetricians give due consideration to avoid the disabilities caused by injuries to mothers during childbirth.

"My assignment," concluded Dr Rice, "was to point out the problems as they relate to the public health. Let us hear concrete suggestions for meeting them. I hope that this will not be 'just another meeting'. The situation demands more than mere discussion, it calls for action."

2 COURSE, CONDUCT, AND COMPLICATIONS  
OF LABOR AMONG PHYSICIANS' WIVES

R. D. MUSSEY

JOHN FABER

The group was selected as typifying the private practice of obstetrics among women from whom understanding cooperation could be expected during pregnancy and labor. This forms a natural method of sampling the obstetric practice from January 1, 1914 to January 1, 1937.

Data from the case records of these, 553 consecutive confinements among 241 physicians' wives, have been grouped under four general

headings (1) Prepartum examination and care (2) Aseptic technic (3) The perfection of methods of operative delivery (4) Anesthesia and analgesia

Adequate prepartum care is recorded in 472 pregnancies. There were eight patients with pre eclampsia, one with nephrosis and one with postpartum eclampsia. A splenectomy for hemorrhagic purpura was performed during pregnancy without untoward incident.

Complicating labor there were two cases of placenta previa and three of premature partial placental separation. There were ten postpartum hemorrhages of mild, and two of severe degree. Twenty one patients had puerperal morbidity, there was no proven septicemia.

Eighty-one of the 553 confinements were complicated by some degree of pelvic contraction. Occiput posterior positions were recorded sixty-seven times, breech twenty five times and face once.

Mention is made of the persistently high national maternal mortality rate from puerperal sepsis, together with the need for constant attention to the details of asepsis. Induction of labor by mechanical means without clear obstetric indications is questioned.

Five hundred sixty one infants were born to 553 women, 412 births, including 16 breech deliveries, were spontaneous, 126 were vaginal operative deliveries, and 23 including one set of twins were by abdominal cesarean section.

There were no maternal deaths. The total fetal death rate was 3.9 per cent. Subtracting the premature stillbirths and the full term prepartum stillbirths, this leaves a fetal mortality of 2.4 per cent.

Comment is made that the injudicious use of analgesia and anesthesia is responsible for a marked increase in the incidence of operative deliveries which in turn tends to increase fetal and maternal complications, particularly puerperal sepsis.

### 3 OBSTETRICS AND GYNECOLOGY FROM THE VIEWPOINT OF THE MEDICAL EXAMINER

HARRISON S. MARTLAND

The interest of the Medical Examiner in obstetrics and gynecology is concerned principally with deaths following abortion, while under anaesthesia, within 24 hours after admission to a hospital, after unnecessary operations, from pulmonary embolism, due to the use of drugs, especially those causing agranulocytosis, from transfusion accidents, and similar conditions. Also neonatal deaths due to prematurity, asphyxia, birth injuries, intracranial hemorrhage, burns, poisoning, deaths in incubators, cribs. The medicolegal aspects and prevention of many of these fatalities are discussed in detail.

The increase in criminal abortion and birth control is becoming a serious problem. The present birth rate in this country is barely capable of maintaining our population. Conviction of the professional abor-



tionist is extremely difficult. He comes to the notice of the police only if a woman dies or "squeals." Juries rarely convict, for many individuals have had abortions performed in their immediate families and condone the practice, judges often believe criminal abortion should be legalized, the time worn defense that the woman was bleeding when the abortionist saw her, has the prosecution "licked" from the start, abortionists have been known to contribute heavily to political campaigns, and "fiddle-faced" politicians often aid in obstructing justice.

In the discussion of "Reproductive Waste" due to criminal abortion, venereal disease, birth control and other deviations, three solutions are offered

(1) "Let things ride"—ignore the existence of the situation

(2) Attempt to strengthen the present social structure—formulate a policy of reproduction, with positive encouragement of motherhood, State awards for children, legalization of illegitimates, better economic conditions, to facilitate marriage of young people, enforce our present laws, compile police lists of known abortionists, enforce strict regulation of semimedical quacks—and encourage religious morality, the main barrier against a world "going haywire"

(3) Legalize criminal abortion, birth control, free love, nudist colonies, euthanasia, ad nauseam

Regardless of political or social changes, the medical profession must remain independent and "clean." We must, however, consider the conservation of child-bearing women, the reduction of maternal and infant mortality, and an unrelenting drive against venereal disease as our responsibility.

## MEMBERS ELECTED MAY 6, 1937

### COMMITTEE ON ADMISSION

Arthur H. Aufses	1085 Park Avenue
Moses Cohen	44-62 23 Street, L. I. C.
Fritz Cramer	30 Beekman Place
Isadore Earle Gerber	19 East 98 Street
Frank C. Hamm	35 Prospect Park W., Brooklyn
Francis M. Harrison	121 East 31 Street
Ernest Hall Kline	63 N. Broadway, N. Y.
Robert M. Lintz	975 Park Avenue
Donald E. McKenna	80 Hanson Pl., Brooklyn
Edward King Morgan	52 Remsen St., Brooklyn
Ronald E. Mussey	2169 Fifth Ave., Troy, N. Y.
Bronson S. Ray	310 East 75 Street
Carl H. Smith	119 East 84 Street
Benjamin Morgan Vance	119 East 84 Street
Franklin Howard Westcott	1435 Lexington Ave.

## A SELECTION OF RECENT ACCESSIONS

"Possession does not imply approval"

- American Foundation American medicine, expert testimony out of court  
N Y, American Foundation, [1937], 2 v
- Brunbridge, F A and Menzies, J A *Essentials of physiology* 8 ed  
London, Longmans, [1936], 651 p
- Bildwin, L An introduction to comparative biochemistry  
Cambridge [Eng], Univ Press, 1937, 112 p
- Bentley, J E Superior children their physiological, psychological and  
social development  
N Y, Norton, [1937], 331 p
- Bing, R *Lehrbuch der Nervenkrankheiten* 5 Aufl  
Berlin, Urban, 1937, 618 p
- Bircher, E *Das Kropfproblem*  
Dresden, Steinkopff, 1937, 143 p
- Brandt, G *Verzögerte Knochenbruchheilung und Pseudarthrosenbildung*  
Leipzig, Thieme, 1937, 175 p
- Braun, A *Medizinisches aus der Weltliteratur*  
Stuttgart, Enke, 1937, 152 p
- Burns, B H and Ellis, V H *Recent advances in orthopaedic surgery*  
London, Churchill, 1937, 296 p
- Darlington, C D *Recent advances in cytology* 2 ed  
London, Churchill, 1937, 671 p
- Davis, A E *Cataract, its preventive and medical treatment*  
Phil, Davis, 1937, 161 p
- Davis, H T and Nelson, W F C *Elements of statistics* 2 ed  
Bloomington, Ind, Principia Press, [1937], 434 p
- Elhott, G L *Women after forty*  
N Y, Holt, [1936], 213 p
- Fischer, M H *Christian R Holmes, man and physician*  
Springfield, Ill, Thomas, 1937, 233 p
- Hackett, C J *Boomerang leg and laws in Australian aborigines*  
London, Royal Society of Tropical Medicine and Hygiene, 1936, 66 p
- Haggard, H W *Staying young beyond your years*  
N Y, Funk, [1937], 89 p
- Handbook of microscopical technique Edited by C E McClung 2 ed  
N Y, Hoeber, 1937, 698 p
- Harris, L J *Vitamins in theory and practice* [2 ed]  
N Y, Macmillan, [1937], 242 p
- Histoire generale de la médecine publie sous la direction du Docteur  
Laignel-Lavastine  
Paris, Michel, [1936], v 1
- International surgical association Dixième congrès de la Société inter-  
nationale de chirurgie, Le Caire, 31 déc 1935—4 jan 1936 Rapports,  
proces-verbaux et discussions  
Bruxelles, Imprimerie Med Scien, 1936, 3 v

- Kleinschmidt, H E Tuberculosis [Rev ed]  
N Y, Funk, [1937], 77 p
- Kotschau, K and Meyer, A Theoretische Grundlagen zum Aufbau einer  
biologischen Medizin  
Dresden, Steinkopff, 1936, 217 p
- Koll, I S Medical urology  
St Louis, Mosby, 1937, 431 p
- Kopsch, F W T Die Nomina anatomica des Jahres 1895 (B N A)  
Leipzig, Thieme, 1937, 103 p
- Loewenberg, S A Clinical endocrinology  
Phil, Davis, 1937, 825 p
- Maher, C C Electrocardiography 2 ed  
Balt, Wood, 1937, 254 p
- Mauz, F Die Veranlassung zu Krampfanfällen  
Leipzig, Thieme, 1937, 68 p
- Miner, L M S Why the teeth?  
N Y, Funk, [1937], 71 p
- Orton, S T Reading, writing and speech problems in children  
N Y, Norton, [1937], 215 p
- Plant, J S Personality and the cultural pattern  
N Y, Commonwealth Fund, 1937, 432 p
- Reinig, W F Melanismus, Albinismus und Rufinismus  
Leipzig, Thieme, 1937, 122 p
- Rice, T B The human body  
N Y, Funk, [1937], 88 p
- Risak, E Der klinische Blick  
Wien, Springer, 1937, 153 p
- Rose, (Mrs) M D (Swartz) The foundations of nutrition Rev ed  
N Y, Macmillan, 1937, 630 p
- Rowell, H G Hear better  
N Y, Funk, [1937], 83 p
- Schwarz, G, Goldberger, J and Crocker, C Diagnosis and non-operative  
treatment of the diseases of the colon and rectum  
N Y, Hoeber, 1937, 540 p
- Scott, G R A history of prostitution  
London, Laurie, [1936], 239 p
- Scott, J R Diabetes  
N Y, Funk, [1937], 132 p
- Shands, A R and Raney, R B Handbook of orthopaedic surgery  
St Louis, Mosby, 1937, 593 p
- Stumpf, P Zehn Vorlesungen über Kymographie  
Leipzig, Thieme, 1937, 112 p
- Sutherland, H G In my path  
London, Bles, [1936], 263 p
- Vaughan, K O Safe childbirth  
London, Bailliere, 1937, 154 p

- Warbasse, J P and Smith, C M Surgical treatment 2 ed  
Phil, Saunders, 1937, 3 v and index
- Whitwell, J R Historical notes on psychiatry  
London, Lewis, 1936, 252 p
- Wilder, J Klinik und Therapie der Zuckermangelkrankheit  
Wien, Weidmann, 1936, 100 p
- Wilke, G Die Heilkunde in der europäischen Vorzeit  
Leipzig, Kahitzsch, 1936, 418 p

## PROCEEDINGS OF ACADEMY MEETINGS

MAY

### STATED MEETINGS

Called for the purpose of presenting to the Academy membership important matters connected with the finances and policies The usual invitation to guests was suspended for this executive meeting of the Academy

- I EXECUTIVE SESSION—1 Reading of the Minutes 2 Presentation of Diplomas
- II ACADEMY POLICIES AND FINANCES—James Alexander Miller President Alfred E Cohn Chairman Committee on Library George Baehr Chairman Committee on Public Health Relations Carl Eggers Chairman Committee on Medical Education, Orrin S Wightman Medical Information Bureau William Barclay Parsons Chairman Committee on Fellows and Members Fund Raising Campaign Discussion
- III REPORT ON ELECTION OF MEMBERS

May 20

THE HARVEY SOCIETY (IN AFFILIATION WITH THE NEW YORK ACADEMY OF MEDICINE)

THE EIGHTH HARVEY LECTURE Transmissions of Nervous Effects by Acetylcholine  
Sir Henry Dale Director National Institute for Medical Research London England

### SECTION MEETINGS

SECTION OF DERMATOLOGY AND SYPHILOLOGY—May 4

- I READING OF THE MINUTES
- II PRESENTATION OF CASES—a Beth Israel Hospital b Good Samaritan Dispensary  
c Sea View Hospital d Miscellaneous cases
- III DISCUSSION OF SELECTED CASES
- IV EXECUTIVE SESSION—Election of Section Officers and member of Advisory Committee  
For Chairman Louis Chargin For Secretary Harry C Saunders For member of  
Advisory Committee A Benson Cannon

COMBINED MEETING OF SECTION OF NEUROLOGY AND PSYCHIATRY  
AND THE NEW YORK NEUROLOGICAL SOCIETY—May 4

(PLEASE NOTE CHANGE IN DATE)

- I PAPERS OF THE EVENING—a The psychological relation between the physician and the patient H Nunberg Discussion William H Dunn L S Kubie b The feeling of stupidity C P Oberndorf Discussion James H Wall c The social neuroses Paul Schilder Discussion Sandor Lorand Simon Rothenberg d The transference phenomenon in a case of phobia Fritz Wittels Discussion J H W Van Ophuijsen
- II EXECUTIVE SESSION—SECTION OF NEUROLOGY AND PSYCHIATRY—Election of Section Officers and member of Advisory Committee For Chairman Irving Pardee For Secretary Morris Grossman For member of Advisory Committee Abraham A Brill

SECTION OF SURGERY—May 7

- I READING OF THE MINUTES
- II PRESENTATION OF CASES—*a* 1 Case of excision of external condyle of humerus in an old fracture, 2 Case of pseudo pancreatic cyst, James Harry Heyl, *b* Case of stenosing tenovaginitis of the extensor tendon of the thumb Harold Brown Keyes
- III PAPERS OF THE EVENING—*a* Diagnosis of non specific mesenteric adenitis, William Klein, *b* Clinical significance of biliary pancreatic and duodenal reflux, Ralph Colp
- IV GENERAL DISCUSSION
- V EXECUTIVE SESSION—*a* Election of Section Officers and member of Advisory Committee, For Chairman, Roderick V Grace, For Secretary, Frank L Meleney For member of Advisory Committee, William F MacFee

Members of the Section were now invited to submit titles of case presentations or papers for the programs of 1937-38

SECTION OF HISTORICAL AND CULTURAL MEDICINE—May 12

- I EXECUTIVE SESSION—*a* Reading of the minutes *b* Election of Section Officers and member of the Advisory Committee For Chairman Reginald Burbank For Secretary, Howard Reid Craig, For member of the Advisory Committee, Jerome P Webster
- II PAPERS OF THE EVENING—*a* Jean Dominique Larrey A great military surgeon (Lantern slide demonstration and exhibit of mementos), Paul E Bechet, *b* Medical explorers of Arabia, Iago Galdston
- III GENERAL DISCUSSION

SECTION OF PEDIATRICS—May 13

CASE DEMONSTRATIONS FROM 7 30 TO 8 00

- I EXECUTIVE SESSION—Election of Section Officers and member of Advisory Committee For Chairman, Samuel Z Levine, For Secretary, Philip M Stimson For member of Advisory Committee Alexander T Martin
- II PRESENTATION OF SINGLE CASE REPORTS—*a* Babies Hospital, Carcinoma of the thyroid Alfred G Langmann, *b* Bellevue Hospital, Case of familial metaphyseal dysplasia, Harry Bakwin, Arthur Krida, *c* Beth El Hospital, Brooklyn, Otogenic streptococcal meningitis with recovery Abraham M Litvak (by invitation), *d* Beth Israel Hospital Subacute meningococcemia without meningitis, J M Lewis, *e* Israel Zion Hospital, Brooklyn, Brain abscess following purulent ethmoiditis, Mark J Wallfield (by invitation), *f* Jewish Hospital Brooklyn, Rupture of the lung in a newly born infant, Harry Strongin (by invitation), *g* Lenox Hill Hospital, Xeroderma pigmentosum with mental deficiency, A G Silberstein (by invitation), *h* Long Island College Hospital, Brooklyn, Projectile vomiting due to partial urethral obstruction, Lewis A Koch (by invitation), *i* Mount Sinai, Renal rickets with pluriglandular syndrome, Jean Pakter (by invitation), *j* Polyclinic Hospital, Torsion of the testicle in the new born, Harry Zuckerman (by invitation), *k* Post Graduate Hospital, Sarcoma of the mediastinum in a boy ten years old, George M Wheatley (by invitation), *l* Roosevelt Hospital, Wilms tumor of the kidney, John F Landon, *m* St Vincent's Hospital, Diaphragmatic hernia with operative repair, Thomas Waldie Clarence Howley, *n* Willard Parker Hospital A second attack of poliomyelitis, Alfred E Fischer, Maxwell Sullerman (by invitation)

SECTION OF OPHTHALMOLOGY—May 17

Program arranged by EYE DEPARTMENT OF ST LUKE'S  
Lenox Hill and Post Graduate Hospitals

INSTRUCTIONAL HOUR 7 00 TO 8 00 p m—Congenital Ocular Muscle Anomalies, Rudolph Aebli

REGULAR PROGRAM

- I EXECUTIVE SESSION—*a* Reading of the Minutes *b* Election of Section Officers and member of the Advisory Committee For Chairman James W White For Secretary Rudolph Aebli For Member of Advisory Committee John H Dunnington
- II REPORT OF CASES—*a* Chancres of the upper eyelid in a two month s old infant, Alfred Appelbaum (by invitation) *b* Synchysis scintillans in anterior chamber Girolamo Bonaccolto *c* Paget s disease of the skull W Guernsey Frey *d* Laurence Moon Biedl Syndrome H Templeton Smith Discussion John M McKinney (by invitation)
- III PAPERS OF THE EVENING—*a* The relation of ametropia to ocular motor anomalies James W White *b* Operative injuries of the eye Percy Fridenberg (by invitation)

SECTION OF MEDICINE—May 18

HOUSE OFFICER AND RESIDENT PROGRAM

- I EXECUTIVE SESSION—Election of Section Officers and member of Advisory Committee For Chairman Joseph Hajek For Secretary Thomas T Mackie For member of Advisory Committee Paul Reznikoff
- II PAPERS OF THE EVENING—*a* Cyanosis due to methemoglobinemia complicating para amino benzene sulfonamide therapy Irving Posner New York Post Graduate Medical School and Hospital (by invitation) (12 minutes) Discussion Walter G Lough (5 minutes) *b* Hypoproteinemia of undetermined origin Max Needleman Beth Israel Hospital (by invitation) (12 minutes) Discussion H Vesell (5 minutes) *c* Torula meningo encephalitis James Weinberg City Hospital (by invitation) (12 minutes) Discussion J Homer Cudmore (5 minutes) *d* Still s disease with amyloidosis Howard B Shookhoff Montefiore Hospital (by invitation) (12 minutes) Discussion Leopold Lichtwitz (5 minutes) *e* Insulin sensitivity in diabetes mellitus Gerald Flaum Third Medical Division (N Y U) Bellevue Hospital (by invitation) (12 minutes) Discussion Elaine P Ralli (5 minutes) *f* The association of pulmonary abscess and tuberculosis David F Loewen Tuberculosis Service (Columbia) Bellevue Hospital (by invitation) (12 minutes) *g* Boeck s sarcoid William T Medl, St Luke s Hospital (by invitation) (12 minutes) Discussion Lewis F Frissell (5 minutes) *h* Early feeding (Meulengracht diet) in bleeding peptic ulcer Edward R Schlesinger Mt Sinai Hospital (by invitation) (12 minutes) Discussion B S Oppenheimer (5 minutes)

SECTION OF GENITO URINARY SURGERY—May 19

- I NEW INSTRUMENT—*A* hemostatic catheter modification of Foley catheter Robert Severance
- II CASE REPORT—Carbuncle of the kidney report of two cases Harold E Stedman (by invitation)
- III PAPER OF THE EVENING—*A* study of 150 consecutive cases of ureteral calculi James B Hicks Boston (by invitation) Discussion by Allister M McLellan J Sydney Ritter Francis P Twinem
- IV EXECUTIVE SESSION—Election of Section Officers and member of Advisory Committee, For Chairman, Fedor L Senger For Secretary John A Taylor For member of Advisory Committee Joseph A Hyams

SECTION OF OTOLARYNGOLOGY—May 19

- I EXECUTIVE SESSION—*a* Reading of the Minutes *b* Election of Section Officers and member of Advisory Committee For Chairman Clarence H Smith For Secretary James W Babcock For member of Advisory Committee Edmund Prince Fowler
- II PRESENTATION OF CASES AND INSTRUMENTS—*a* Radiographic device for the antero posterior mensuration of the ethmoids and sphenoids, Solomon Fineman *b* Carcinomatous metaphasia in case of uncontrollable polyposis of the nose Irving B Goldman *c* Frontal lobe abscess secondary to empyema of the sphenoid Abraham Kaplan (by invitation)

- III PAPERS OF THE EVENING—1 Orbital infections due to nasal sinusitis A study of 114 cases Louis Hubert Discussion by Frank C Keil, Francis W White 2 Osteomyelitis of the cranial vault Lantern slides, Joseph E King, Discussion by E Ross Faulkner Frederick M Law, 3 Infection of the carotid canal area cured by cervical operation Mervin C Myerson 4 Air spaces in the skull in hemiatrophy of the brain Leo M Davidoff, 5 Some cases of special interest to the otolaryngologist seen on the neurological service, Page Northington

#### IV GENERAL DISCUSSION

##### SECTION OF ORTHOPEDIC SURGERY—May 21

- I EXECUTIVE SESSION—*a* Reading of the minutes, *b* Election of Section Officers and member of Advisory Committee, For Chairman, Earl E VanDerwerker For Secretary, Joseph B L Episcopo For member of the Advisory Committee, Nicholas S Ransohoff
- II PAPERS OF THE EVENING—*a* Punch biopsy diagnosis of bone tumor, William J Hoffman *b* Studies on the intervertebral disk, William L Donahue (by invitation) *c* Correction of dorsum rotundum David R Telson (by invitation), *d* The evolution of the knee joint Maurice H Herzmark (by invitation), *e* Abnormal gait as a guide in diagnosis (motion picture demonstration) Samuel Boorstein *f* A new type of foot brace for the management of foot imbalances Harry Weiner

##### SECTION OF OBSTETRICS AND GYNECOLOGY—May 25

##### *Residents' Program*

PRESENTATIONS—10 minutes, DISCUSSIONS—5 minutes

- I EXECUTIVE SESSION—*a* Election of Section Officers and member of the Advisory Committee, For Chairman, Thomas E Lavell For Secretary, Edward H Dennen For member of the Advisory Committee, Arthur M Reich
- II PRESENTATION OF CASES—*a* Morrisania City Hospital Transverse septum of the vagina complicating pregnancy, two cases Arthur M Davids (by invitation) Discussion Harry Aranow, *b* Post Graduate Hospital Frank Geist operation for congenital absence of vagina Edward N Smith (by invitation), Discussion Walter T Dannreuther
- III PAPERS OF THE EVENING—*a* Bellevue Hospital, Skin hyperaesthesia in acute salpingitis, John S Labate (by invitation) Discussion Edward M Livingston *b* Margaret Hague Maternity Hospital Observations on the relative efficiency of two types of ergot preparations in the control of postpartum bleeding Roger C ter Kuile (by invitation) Discussion S A Cosgrove *c* Methodist Episcopal Hospital, An x ray study of gastric function during labor, Albert Hersheimer (by invitation), Discussion George Hamilton Davis (by invitation), *d* New York Hospital Woman's Clinic A study of elderly primipara Cloyce R Tew (by invitation) Discussion Hervey C Williamson, *e* Sloane Hospital for Women The significance of Clostridium Welchii in the genital tract of pregnant and puerperal women Stanley M Bysshe (by invitation), Discussion Benjamin P Watson *f* Woman's Hospital, Acid Allurate—A clinical study of this drug as a rectal analgesic during labor, Mary DeWitt Pettit (by invitation) William Alexander Graham (by invitation), Discussion Ralph A Hurd

##### NEW YORK ROENTGEN SOCIETY in affiliation with

##### THE NEW YORK ACADEMY OF MEDICINE—May 17

- I PRESENTATION OF CASES
- II PAPER OF THE EVENING—Roentgen Ray Therapy as a Diagnostic Measure in Tumors of the Mediastinum and Superior Sulcus, John R Carty
- III GENERAL DISCUSSION—To be opened by William deW Andrus (by invitation) Maurice Lenz
- IV EXECUTIVE SESSION

NEW YORK MEETING OF THE SOCIETY FOR EXPERIMENTAL  
BIOLOGY AND MEDICINE—May 19

- I Selective axonal and trans synaptic progression of certain viruses and the role of localized barriers in preventing or arresting infection of the central nervous system  
A B Sabin Rockefeller Institute for Medical Research
- II Studies on experimental hypertension, F Glenn and C G Child III (Introduced by B Webster) Cornell Medical College
- III A case of diabetes mellitus refractory to insulin therapy H H Mason (Introduced by A E Severinghaus) College of Physicians and Surgeons
- IV Newer aspects of capillary structure and physiology (Accompanied by motion pictures) B W Zweifach (Introduced by H W Smith) New York University

The program of this meeting of the Society which was open to members and their guests, consisted of invited papers

NOTICE—Members were requested to attend this meeting to hear the report of the Nominating Committee and to act upon their nominations

NEW YORK PATHOLOGICAL SOCIETY *in affiliation with*

## THE NEW YORK ACADEMY OF MEDICINE—May 27

- I CASE PRESENTATIONS—  
a Complete absence of septum pellucidum Vera B Dolgopoi  
b Spontaneous extrusion of spleen in a case of B Welchii bacteremia with recovery  
S H Polayes
- II PAPERS OF THE EVENING—  
a Endocardial, arterial and other mesenchymal alterations in man associated with serum disease Eugene Clark Bernard Kaplan (by invitation)  
b Tuberculous meningitis in relation to tuberculoma David Beres (by invitation)  
Theodore Meltzer (by invitation)
- III EXECUTIVE SESSION





## DEATHS OF FELLOWS

FOX, GEORGE HENRI, A B, M D, 145 East 54 Street, New York City, received the degree of Bachelor of Arts from Rochester University in 1867 and graduated in medicine from the University of Pennsylvania in 1869, elected a Fellow of the Academy January 8, 1880, died May 3, 1937 Dr Fox had been surgeon to the New York Dispensary from 1873 to 1875, clinical professor of diseases of the skin at Woman's Medical College of New York Infirmary from 1875 to 1879, clinical professor of dermatology at Starling Medical College (Columbus, Ohio) in 1879, clinical professor of diseases of the skin from 1881 to 1904 and professor of dermatology from 1904 to 1907 at the College of Physicians and Surgeons (Columbia), and professor of skin diseases at the Post-Graduate Medical School from 1890 to 1895

He was President of the New York County Medical Society in 1892, President of the State Medical Society in 1895 and Honorary President of the American Dermatological Association in 1926 He was a member of the Royal Society of Medicine (Great Britain), a Fellow of the American Medical Association and held a certificate from the American Board of Dermatology and Syphilology Dr Fox was the author and illustrator of many articles on dermatological subjects

PIERSON, SAMUEL, M D, Stamford, Connecticut, graduated in medicine from the College of Physicians and Surgeons in 1881, elected a Fellow of the Academy April 2, 1896, died April 22, 1937

Dr Pierson was a Fellow of the American College of Surgeons and the American Medical Association and a member of the County and State Medical Societies

WYCKOFF, JOHN HENRY, M D, 104 East 40 Street, New York City, graduated in medicine from the University and Bellevue Hospital Medical College in 1907, elected a Fellow of the Academy January 3, 1918, died June 1, 1937 Dr Wyckoff had been Professor of Medicine and Dean of the New York University and Bellevue Hospital Medical College since 1932 and Director of the Third Medical Division at Bellevue Hospital since 1928 He was consulting physician to the Nyack, St John's (Long Island City), Good Samaritan (Suffern), South Side (Bay Shore), Presbyterian (Newark), St Luke's (Newburgh), St Joseph's (Yonkers), and Mt Vernon and St Agnes (White Plains) Hospitals

He was a Fellow of the American Medical Association, and a member of the Association of American Physicians, the American College of Physicians, the American Clinical and Climatological Association and the County and State Medical Societies Dr Wyckoff served the Academy as a member of the Committee on Medical Education since 1928 and as a member of the Committee on Public Health Relations in 1932 He was elected a member of the Board of Trustees in January, 1937

# BULLETIN THE NEW YORK ACADEMY OF MEDICINE

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No 7

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## TRANSMISSION OF NERVOUS EFFECTS BY ACETYLCHOLINE

Harvey Lecture, May 20, 1937

SIR HENRY DALL

*Director, National Institute for Medical Research,  
London, England*

Just four years ago Otto Loewi lectured here on "the humoral transmission of nervous impulse" It was most fitting that he should be the first to lecture to this Society on that subject, since it was through the experiments which he made with his pupils and co workers, and described in a series of papers published between 1921 and 1926, that such transmission became an experimental reality Professor Loewi referred in his lecture to some of the speculations and experimental hints concerning such a process, which had anticipated his own now classical demonstration of its occurrence In that connection he referred to the well known and fundamentally important observations of Howell (1906, 1908), on the mobilization of potassium ions as a concomitant of vagus inhibition of the heart I find no evidence, however, that Professor Howell thought of a liberation of potassium ions as occurring at the vagus nerve endings, and transmitting the inhibitory stimulus from them to the heart fibres I think that it would have been more natural, from his description, to form a conception of the mobilization of potassium in the heart muscle cells, as part of the essential change in those cells, evoked by the vagus impulses and resulting in inhibition of their rhythm This seems, in any case, to be the proper interpretation of the meaning of Howell's facts, in the light of the now accepted identification of acetyl

choline, as the transmitter of the effects of vagus impulses from the nerve endings to heart cells. Professor Lehnartz (1936), of Gottingen, working last year as a guest in my laboratory, confirmed Howell's observation of the increase of potassium ions in the Ringer solution filling a tortoise auncle, when the vagus nerves were effectively stimulated. He found, however, that the addition of acetylcholine to the Ringer solution, in a concentration producing a comparable inhibition of the heart rhythm, caused an entirely similar mobilization of potassium ions. He further observed that, when the inhibitor effect of vagus impulses, or of adding acetylcholine to the solution, was prevented by atropine, no potassium ions were released. Clearly the observed mobilization of potassium is part of the inhibitory process in the heart cells, and not of the transmission to them of the vagus effect. The real anticipation, I think, of what Loewi so simply and convincingly demonstrated, is to be found in the speculation current among younger workers in the Cambridge (Eng.) school about the years 1904 to 1906. It started with Elliott's (1904) penetrating suggestion, that sympathetic nerve impulses act on the effector cells by liberation of epinephrine (adrenalin) at the nerve endings. By an obvious analogy the late W. E. Dixon (1906, 1907) extended the suggestion to parasympathetic nerves and muscarine, and even put forward experiments on the heart and the vagus, which purported to demonstrate such a mechanism, but failed to carry conviction. What is remarkable, I think, in retrospect, is the fact that Dixon first described these rather unconvincing experiments at a meeting in Toronto in 1906, at which Reid Hunt also gave the first account of his discovery of the remarkable depressor activity of acetylcholine. Neither, apparently, saw any connection between the two sets of observations. When, however, in 1914, I came across acetylcholine in another connection, and studied its action in greater detail, the obvious relation of that action to parasympathetic nerves, so suggestively similar to the relation between the action of epinephrine and the true sympathetic system, could not but revive interest in ideas

which had, by then, been almost forgotten. We advanced no further, however, than the reflection that, if there were direct evidence in favour of Elliott's conception concerning epinephrine and sympathetic action, we should have to think of something like acetylcholine in relation to parasympathetic effects, and there the matter remained till 1921.

Then came Loewi's experiments, and, after the few years necessary for accommodation to a new set of ideas, the transmission of the excitatory, or inhibitory, stimulus from the peripheral endings of autonomic nerve fibres to effector cells, by the liberation of specific chemical stimulators, became a part of the accepted teaching of physiology. Loewi described two different chemical substances, one responsible for the transmission of inhibitor effects from the vagus, the other for that of accelerator effects from the sympathetic nerve endings to the muscle fibres of the frog's heart, and it was impossible not to think of acetylcholine and epinephrine, though there was, at that time, no evidence that acetylcholine even occurred in the body. Cannon and his co-workers (1921, 1931) by a line of investigation having a different object, were beginning to get evidence, about the same time, of something passing into the circulation when certain sympathetic nerves were stimulated, and reproducing sympathetic effects on distant organs. In the intervening years they have published a large volume of observations on these phenomena, full of suggestion and interest, and leading them to the conclusion that the sympathetic transmitter, which they refer to as "sympathin," is not epinephrine itself. On the other hand, there are experiments by Bacq (1933), who took part in Cannon's investigations at an important stage, and most recently by Loewi (1936) himself, which suggest that "sympathin" corresponds with epinephrine, in every character for which it can be tested *in vitro*, and strongly suggest that the two are identical.

When Loewi lectured here in 1933, he had just reached the point of accepting the identity of his *Vagusstoff* with acetylcholine, after some twelve years of doubt and hesitation.

It was not until 1929, indeed, that my late colleague, H W Dudley, had first succeeded in isolating acetylcholine as a natural constituent of an animal organ. Loewi's chief obstacle to the identification, however, had been the resistance of certain parasympathetic effects to atropine, though, as I had pointed out, his own brilliant experiments had shown that the *Vagusstoff* was, in any case, an unstable ester of choline, and the atropine difficulty would stand equally in the way of any of these, and even of choline itself. The demonstrated liberation of a substance indistinguishable from acetylcholine, even in connexion with parasympathetic nerve actions which were themselves resistant to atropine, had overcome finally, by 1933, Loewi's very proper hesitation but the same kind of difficulty has reappeared more recently in a somewhat new form in relation to both parasympathetic and sympathetic transmission. Henderson and Roepke (1934) observed that stimulation of the parasympathetic pelvic nerve produced on the urinary bladder an effect in two phases, a contractile and tonus phase. Acetylcholine, unless injected in sufficient concentration to stimulate the autonomic ganglion cells, reproduced only the tonus phase of this effect, and only this phase was susceptible to atropine paralysis. Bacq and Monnier (1935) report an effect in many ways similar, produced by the synthetic dioxane derivative, numbered 933 F, on the response of the mictitating membrane to sympathetic impulses. Here, again, stimulation of the cervical sympathetic nerve causes an initial quick retraction of the membrane, followed by a secondary, slow phase. Only the latter is reproduced by injecting adrenaline, and this phase alone is weakened or suppressed by 933 F leaving the initial, quick response to nerve stimulation relatively unaffected, or even enhanced.

Bacq and Monnier, and, if I understand them correctly, Henderson and Roepke, regard the first, quick phase of these reactions as due to the direct passage of the propagated physico chemical disturbances, which constitute the nerve impulses, to the particular plain muscle fibres on

which the nerve fibres end directly. They regard this as being, for plain muscle under normal conditions, a subsidiary mechanism, the transmission of excitation from nerve endings to such muscle being still mainly effected by release of the chemical transmitter. If we accept this conception, I suppose we should regard the chemical transmission of excitation from nerve ending to effector cell as the more primitive or archaic process. From the observations of Pouchet (1876), of Hogben (1922, 1923, 1931) and especially of G. H. Parker (1936), we have learned that the expansion and contraction of chromatophores, in the skin of lower vertebrates, may be controlled by autonomic nerve impulses in some classes, as in the fishes, and again in the reptiles, while in the amphibia the control may be effected by hormones from distant endocrine organs. Where control is by the nerves, these may have their endings in close relation to the contractile chromatophore cells, or at a significant distance from them. Whether the control is by nerves or from endocrine glands, the evidence suggests that here the immediate, effective stimulus is chemical. Passing to the involuntary muscle and gland cells, we find an autonomic nerve supply, the effects of which are, chiefly at least, transmitted by the release at the nerve endings of one or the other of two chemical stimulants, acetylcholine and epinephrine, to use a terminology which I introduced, we have a nerve supply of which the fibres are cholinergic or adrenergic, and the effects of the adrenergic fibres are curiously reinforced or duplicated by the distribution of epinephrine as a true hormone, carried in the blood from the suprarenal medulla. But Bacq and Monnier would have it that this system of chemical transmission is already supplemented, in certain tracts of plain muscle, by the intervention of a still subsidiary mechanism of physical transmission, concerned with the evocation of a quicker type of contractile reaction. This direct physical transmission is destined, on this conception, to become the predominant or exclusive method for the quick, individualized transfer or excitation at interneuronal synapses, or at the motor nerve endings on voluntary muscle fibres.

There is, however, another way of looking at the same experimental facts. We may suppose, as before, that the primitive form of neuromuscular transmission is one in which a chemical stimulant, liberated at a free nerve ending, reaches the effector cell slowly, by diffusion from a significant distance, and that the need for an increasing speed and localization of reaction is met by a concentration of the same process, due to an increasingly intimate relation of the nerve ending to the effector cell. Ultimately we may suppose that the transmitter comes to be liberated in relatively high concentration, in immediate relation to those plain muscle cells on which the nerve fibres directly end, that its abrupt appearance there produces a quick reaction, starting from these directly innervated cells, and that, in addition, it diffuses from the site of its liberation to reach other, not directly innervated cells, producing in them a secondary, slower reaction, similar in every way to that which the transmitter will produce when it is given by artificial injection, and reaches the effector cells by slow diffusion from the blood. On those lines I think we could account for the two phase reactions described by Henderson and Roepke and by Bacq and Monnier, and the resemblance of the second phases of these to the effects of acetylcholine or epinephrine given by artificial injection, without postulating the intrusion of a new, purely physical transmission of excitation from nerve to muscle.

How are we to judge between these rival interpretations? They would, I think, account equally well for the facts so far considered. You will note, however, that Bacq and Monnier's interpretation implies the assumption that, in the physical transmission, invoked by them to account for certain relatively quick responses of plain muscle, we see the emergence of the process which is to become all sufficient for the voluntary striated muscles. The alternative conception raises, on the other hand, the question whether even for these, with their quickly and individually reacting fibres, the neuromuscular transmission of excitation may not be effected by a sufficiently sudden and concentrated

release of a chemical transmitter at the motor nerve ending, in immediate relation to the nucleated end plate of the striated muscle fibre. Our choice between these two conceptions will depend, accordingly, on our readiness to admit the possibility of an essentially chemical transmission, even from motor nerve to voluntary muscle. Four years ago Otto Loewi was not ready for this admission. "Personally," he said, "I do not believe in a humoral mechanism existing in the case of striated muscle." Almost exactly a year later, W. Feldberg and I (1934) made a first preliminary communication of evidence which had led us to believe that such a mechanism nevertheless existed.

For the starting point of this new development I must ask you to look back for a moment to the description which I had given, in 1914, of the action of acetylcholine. All those actions in which it reproduced the peripheral effects of parasympathetic nerves were easily abolished by atropine, for brevity I had referred to them collectively as "muscarine" actions. When atropine had thus eliminated these, another set of effects came to light, requiring rather larger doses of acetylcholine to elicit them, and closely similar in their nature and distribution to the effects of nicotine. The effects included an intense stimulation of the cells of all autonomic ganglia, and, as later appeared, of voluntary muscle fibres. It was astonishing, indeed, to find these structures stimulated by the same substance as, in the absence of atropine, had so closely reproduced the peripheral, parasympathetic effects. Frankly puzzled, I could at that time only suggest some vague kind of "biochemical similarity between the ganglion cells of the whole involuntary system and the terminations of voluntary nerve fibres in striated muscle, on the one hand, and the mechanism connected with the peripheral termination of cranio sacral involuntary nerves on the other." But, if this duplex activity of acetylcholine was puzzling in 1914, what were we to say of it in 1933 when, after an accumulation and sifting of evidence over many years, all concerned, including Otto Loewi himself, were ready to recognize



acetylcholine as the actual substance released to transmit the peripheral effects of parasympathetic nerves, and of some exceptional nerve fibres belonging to the true sympathetic system? Its "muscarine" actions were thus related to a truly physiological function. What, then, could be the significance of its "nicotine" actions on ganglion cells and voluntary muscles? Were these without physiological meaning?

There were many reasons for hesitation in suggesting that acetylcholine might act as the transmitter of excitation at ganglionic synapses or at voluntary motor nerve endings. The transmission at those points had, equally in both cases, the appearance of a direct, unbroken conduction. In each case a single impulse, reaching a ganglionic synapse or a motor nerve ending, caused the passage, from a ganglion cell along a postganglionic nerve fibre, or from a motor end plate along a voluntary muscle fibre, of a single corresponding wave of excitation. If acetylcholine were here to intervene, as the direct stimulator of the ganglion cell or the muscle end plate, it could only do so by appearing with a flash-like suddenness, from some depôt holding it in inactive association, when a nerve impulse reached a preganglionic or motor nerve ending, and, having produced its stimulating effect and started a secondary wave of excitation from the ganglion cell or the muscle end plate, it must then disappear with a comparable rapidity, in the brief span of the refractory period. The only mechanism which we could picture, by which such a rapid removal of acetylcholine from the site of its release could be effected, was a local concentration, on surfaces at the nerve endings, of the specific cholinesterase, which is generally distributed in the tissues, and which, even in dilute solution, so rapidly inactivates acetylcholine by hydrolysis. I may note, in passing, that recent experiments by Brown and Feldberg (1937) and by Blucke (1937) in my laboratory have shown that the relatively large amounts of acetylcholine and of cholinesterase, which can be artificially extracted from a normal sympathetic ganglion, do, in fact, largely disappear when the preganglionic fibres are cut

and allowed to degenerate Marnay and Nachmansohn (1937) have still more recently obtained evidence of a local concentration of cholinesterase at the neural region of the frog's splanchnic

Our direct evidence of the participation of acetylcholine in the transmission of these rapid excitatory effects came first in the case of the ganglion Chang and Gaddum (1933), confirming Witanowski, had found in my laboratory that sympathetic ganglia gave a surprisingly large yield of acetylcholine to extraction. Then Feldberg, Minz and Tsudziuma (1934) observed that, when the splanchnic nerve was stimulated, acetylcholine appeared at its endings in the suprarenal medulla, there to act as the direct stimulus to the output of epinephrine into the blood. The medullary cells are morphologically analogous to sympathetic ganglion cells, and Feldberg found that the action of acetylcholine on them belonged to the "nicotine" aspect of its action. Obviously we had to see whether stimulation of preganglionic fibres would cause acetylcholine to appear in the ganglion, and Kibjakow (1933) had described a suitable perfusion technique, just when it was required. Using this, with the modification that they added eserine in very low concentration to the perfusion fluid, Feldberg and Gaddum (1934) had no difficulty in proving that, whenever the preganglionic nerve was stimulated, but only then, acetylcholine appeared in the fluid which issued from the vein of the ganglion. It appeared, indeed, in such concentrations that this venous fluid, on reinjection into the arterial side of the perfusion would, on occasion, produce an output of impulses from the ganglion cells. If the liberation of this acetylcholine, appearing thus diluted in the total effluent, took place at the synapses, its appearance there could not fail to stimulate the ganglion cells. Feldberg and Vartiainen (1934) tried the effects of sending impulses through the ganglion of the vagus trunk, where they encounter no synaptic interruptions, and of firing impulses from the postganglionic nerves back into the cells of the sympathetic ganglion, where they stop without

passing the synapses. They obtained no trace of acetylcholine in either case, though preganglionic stimulation in the same experiment caused its immediate appearance. The phenomenon was so regular that they could calculate the amount of acetylcholine liberated at the synapses by a single preganglionic volley, and therefrom the quantity liberated by one impulse in contact with one ganglion cell, it was of the order of  $10^{15}$  gramme, or about 3 million molecules of acetylcholine. They further observed that the ganglion cells could be paralyzed by nicotine and curarine, and that, under these conditions, preganglionic stimulation still caused the appearance of acetylcholine, though neither this stimulation, nor the injection of acetylcholine into the artery of the ganglion, now had any effect on the ganglion cells. Brown and Feldberg (1936a) later found that an appropriate dose of curarine, while it abolishes simultaneously the reactions of the ganglion cells to preganglionic nerve impulses and to acetylcholine, leaves them fully responsive to potassium ions. We are inevitably reminded of the observations of Loewi and Navratil (1924) on the effect of atropine on the frog's heart.

These observations have seemed to us to lead inevitably to the conclusion that, in spite of the considerations which made the idea initially difficult to entertain, the excitatory process is actually transmitted across a synapse in an autonomic ganglion, by the liberation of acetylcholine as the impulse reaches the endings of the preganglionic nerve fibres. With regard to the mechanism by which acetylcholine is thus liberated from the inactivating and protective complex in which we must suppose it to be held in the neighbourhood of the preganglionic nerve ending, Brown and Feldberg (1936b) have made the very suggestive observation that, if the potassium content of the perfusion fluid is suddenly augmented, acetylcholine promptly appears in the venous effluent from the perfused ganglion, in a manner strongly reminiscent of its appearance when the preganglionic nerve is stimulated. There is evidence connecting the propagated impulse along a nerve fibre with a wave of mobilization of potassium

ions, and it is tempting to picture this process arriving at the ending of the preganglionic fibre, there immediately liberating a small charge of acetylcholine, which causes the discharge, from the nerve cell sensitive to its action, of a new propagated impulse, perhaps a new wave of potassium mobilization, passing along the postganglionic fibre

It would be wrong to suggest that this conception has proved to be generally acceptable Eccles (1936), in particular, has subjected it to a frank and resourceful criticism This is not the occasion for attempting to reply to his arguments in detail They may fairly be said, I think, to centre round the failure to detect a repetitive discharge of the ganglion cells, in response to a single preganglionic volley, when eserine has been administered It is true that, when acetylcholine reaches the ganglion cells by slow diffusion from the blood vessels, a peripheral response, best recorded as a retraction of the nictitating membrane, is evoked, which can only be attributed to a repetitive discharge of impulses from the cells of the ganglion It is reasonable, accordingly, to enquire whether eserine, by depressing the cholinesterase at the synapses, will not allow the acetylcholine, liberated by a single preganglionic volley, to persist there long enough to produce such an effect I think that it is, in fact, not certain that the potentiation of the effect of preganglionic stimulation, which Feldberg and Vartiainen (1934) observed with a low concentration of eserine was not of this kind The position, however, is complicated by the fact that persistence of acetylcholine in contact with the ganglion cells very soon produces a depressant effect, in place of a continued stimulation, and that eserine, in concentrations above a certain low level, paralyzes the response of the ganglion cells to preganglionic impulses or acetylcholine, in a manner recalling the effect of nicotine or curare We can admit that there are still points of difficulty here to be resolved, without regarding them as destroying the significance of all the positive evidence in favour of chemical transmission at the ganglionic synapses, by the sudden

release and disappearance of acetylcholine there, in immediate relation to the ganglion cells

The case of the voluntary muscle presented additional difficulties. A sympathetic ganglion is a small structure, and the synaptic endings of preganglionic fibres are closely packed in it. If acetylcholine were liberated by the arrival of preganglionic impulses at these endings, we might expect to find it in reasonable concentration, in the fluid slowly percolating through the very small vascular bed of the ganglion, and my colleagues had, in fact, so found it. In the voluntary muscle, on the other hand, the motor nerve endings are thinly scattered, one to each small part of the enormous mass, and only a very small part of the perfusion needed to keep the muscle alive makes any contact with them. If acetylcholine were liberated at these endings by the arrival there of motor nerve impulses, we should, accordingly, expect to find it, if at all, only in very low concentration in the fluid flowing rapidly from the vein. The concentration which we found was small, indeed, but not too small to be detected and measured by the delicate physiological tests available [Dale, Feldberg and Vogt (1936)]. The substance so detected showed the physiological activities of acetylcholine, not only on one test object, but in the characteristic proportions on several, including some reacting to its "nicotine" and others to its "muscarnine" effects. It was rapidly destroyed by cholinesterase or by alkali, there could be no reasonable doubt, indeed, as to its identity. Though the quantity obtained was small, it was of the order to be expected perculating, as in the case of the ganglion, the quantity liberated by one impulse arriving at a motor nerve ending, we obtain a picture of the order as that obtained for a single impulse from a single ganglion cell, namely  $10^{15}$  grams of the value thus calculated from, I do not lay stress on the data, I quote it only as evidence.

of acetylcholine obtained, in the case of the voluntary muscle, created technical difficulties of experiment rather than theoretical difficulties of interpretation

This acetylcholine was obtained when the muscle responded to stimulation of its motor nerve fibres alone, to the complete exclusion of the automatic and sensory fibres found in the mixed muscular nerve. If the muscle, however, was freed from nerve endings by degeneration, and made to contract by direct stimulation, not a trace of acetylcholine appeared. On the other hand, if the response of the muscle to motor nerve impulses was completely suppressed by curarine, stimulation of the nerve caused the usual output of acetylcholine from the quiescent muscle. As in the case of the heart treated with atropine, or the ganglion cells with nicotine, the acetylcholine was not produced by the response of the effector cells, but by the arrival at the nerve endings of the impulses which normally evoked that response.

Before we were entitled, from such evidence, to suggest that this appearance of acetylcholine, in response to a motor nerve impulse, provided the effective stimulus for the quick, propagated contraction of a voluntary muscle fibre, there were other and serious difficulties still to be met. The chief of these was the lack of convincing evidence that acetylcholine was capable of eliciting, from a normal voluntary muscle, a reaction of this type. The known reactions of voluntary muscles to acetylcholine, whether these were the normal muscles of frogs and other lower vertebrates, or the denervated muscles of mammals, appeared to be of the nature of slow contractions, rather than tetanic summations of quick, propagated contractions. As for the normal muscles of mammals, their responses even to large doses of acetylcholine were, at best, doubtful and irregular. When we reflected on the manner in which acetylcholine must reach the end plates of the muscle fibres, if it acted, indeed, as the transmitter of excitation from the motor nerve endings—that it must be liberated quite suddenly, so that its concentration would rise abruptly and simultaneously at every motor end plate,

falling with a comparable speed during the refractory period of the muscle fibre—it was clear that the ordinary methods of administration, by immersion of the excised muscle, or by injection of acetylcholine into the general circulation, could not be expected to reproduce these effects of its natural liberation. We could not imitate them closely by any artificial method of application, but we could, at least, secure a much more rapid access of acetylcholine to the sensitive points, presumably the motor end plates, of the muscle fibres, by suddenly injecting a small dose, dissolved in a small volume of saline solution, into the blood vessels of the muscle, momentarily emptied of blood by clamping the main artery. Even so, only a small part of the dose injected would reach the points of action, it would not reach them simultaneously but, at best, in rapid and irregular succession, and it would continue for a measurable interval to reach each end plate by diffusion. Altogether, if acetylcholine were indeed the transmitter of motor nerve excitation, the best result which we could expect from such an artificial injection of it would be a short burst of irregular tetanus, and this is exactly what we obtained [Brown, Dale and Feldberg (1936), Brown (1937a)]. A dose as small as 2  $\gamma$ , given by this close, rapid injection into the empty blood vessels of the muscle, would produce a contraction of the same tension as a maximal motor nerve twitch, and not widely different from it in rapidity or duration, which nevertheless was shown by the electrical record to be a short, asynchronous tetanus. There was no doubt, however, that it was compounded of quick, propagated contractions. It was in no sense a contracture.

More recently my colleague Brown (1937b) has obtained electrical records from the gastrocnemius of the frog, and from the denervated mammalian muscle, showing the nature of the responses of these to small doses of acetylcholine given by the method of sudden, direct injection into their empty blood vessels. To small doses of acetylcholine, such as 1  $\gamma$ , thus injected in 0.1 c.c., the frog's gastrocnemius responds by a simple, asynchronous tetanus, with a

maximal tension of several hundred grams, and accompanied by a long lasting outburst of quick potential changes. With larger doses this initial tetanus is easily cut short by the onset of a contracture, which abruptly terminates the electrical outburst. The same sequence of effects is seen when increasing doses of acetylcholine are administered, by close arterial injection to a denervated mammalian muscle. The smallest doses used are of a much lower order than those needed to excite the normal mammalian muscle, but their effects are tetanic contractions. As the dose is increased to the order of 1  $\gamma$ , the initial tetanic response is cut short by a contracture, with the onset of which the muscle becomes electrically silent. The reactions of the normal frog's muscle accordingly resemble those of the denervated more closely than those of the normal mammalian muscle.

If we were right in our supposition that the rapid removal of acetylcholine, from the site of its liberation at the motor nerve endings, was due to a local concentration there of a cholinesterase, it ought to be possible by means of eserine so to depress the action of this esterase, as to delay the disappearance of the acetylcholine liberated by a single motor nerve volley, and thus to modify the response of the muscle. There was no reason, in this case, to anticipate a paralytic effect of eserine on the muscle fibre, and its effect on the mammalian muscle was, indeed, to convert the single twitch, normally evoked by each single nerve volley, into a short tetanus, with a tension which might be as much as five times that of the normal twitch. Bacq and Brown (1937) have examined a series of synthetic eserine substitutes, and have found that their activities, in thus potentiating the mechanical responses of a mammalian muscle to single nerve volleys, are closely parallel to their depressant actions on cholinesterase, which had been independently determined.

We have noted that acetylcholine, if it persists in contact with a ganglion cell, exercises a secondary depressant action. In spite of the potentiating effect of eserine, which we have just been considering, the same depressant



effect can be traced in the mammalian muscle under these conditions, when nerve volleys follow in too rapid succession, or when acetylcholine is applied by artificial injection. Bacq and Brown have shown that a period of faradic stimulation of the motor nerve, under such conditions, may leave the muscle for some time unresponsive to further nerve volleys, and that an injection of acetylcholine will produce a closely similar, curare-like paralysis. There are many points, especially some concerning this secondary, depressant action of acetylcholine, on which further evidence is needed before we can consider their proper relation to the normal physiological process. I hope, however, that the facts which I have brought to your notice have been sufficient to convince you that there is already a case worthy of serious consideration, for the intervention of acetylcholine, in virtue of its nicotine action, as the chemical transmitter of the excitatory process both at ganglionic and at voluntary, neuromuscular synapses. I do not expect, and certainly do not desire, the acceptance of such a conception too easily, or without a thorough and critical scrutiny. I am aware that a certain resistance to it is likely to arise, not merely on its own account, but also from the possibility of its further implications. I know that Dr. Eccles, for example, has made his elaborate studies of the electrical reactions of the sympathetic ganglion, as furnishing an accessible model of the synapses of the central grey matter, and I know from conversation with one whom many of us revere as our master in this field, that Sir Charles Sherrington looks upon the transmission of excitation from a motor nerve ending to a voluntary muscle fibre as probably furnishing a pattern, or paradigm, of what happens at a central synapse.

Such analogies must provoke thought and speculation, but I venture to urge that they have their chief value as a stimulus to the search for direct, experimental evidence. I think I may claim that no definite suggestion was made of a chemical transmission from motor nerve ending to voluntary muscle fibre on mere analogy, or until the experimental evidence seemed to us not only to justify, but

even to require such an interpretation. Similarly, I think that the mechanism of synaptic transmission in the central nervous system ought to be regarded as a matter for separate, direct investigation. Results obtained on a peripheral ganglion or a voluntary muscle may suggest possibilities to be tested, and even methods of investigation. If direct evidence could be produced, in favour of a chemical transmitter at the central synapses, it would require a critical scrutiny in relation to conflicting evidence, which suggests a purely physical mechanism, and if the evidence for a chemical transmitter prevailed, we should need further direct evidence, before we could identify it with one of those which have been found in the peripheral nervous system. An understanding of the process by which nervous excitation passes from neurone to neurone in the measureless complexity of the central grey matter, must surely be one of the highest aims of investigation, the attainment of which would have a transcendent importance, for physiology and for practical medicine. It is the more necessary, I think, that every step towards that goal should be firmly based on experimental data. Nearly three hundred years ago the principle which should guide us was laid down by the founder of experimental medicine, from whom this Society takes its name —

“Nature is herself to be addressed, the paths she shows us are to be boldly trodden, for thus, and whilst we consult our proper senses, from inferior advancing to superior levels, shall we penetrate at length into the heart of her mystery.”

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in a general way yet today the new agencies of war center around chemistry”

The often repeated statement that the next war will begin, as to means and methods, where the last war left off cannot be safely accepted as an axiom. This is particularly true as to chemical warfare. To predict correctly the course and character of a future war is most difficult and probably beyond the power of our wisest and most experienced military men, but to attempt this prediction is absolutely necessary if we are to direct our military medical preparation along sound lines. It is reasonable for us to start from what we know of the World War. We do know that, although the Germans had expended a large portion of their chemical munitions before we entered the war, gas caused twenty seven per cent of our A E F casualties. It had grown more and more important as a tactical weapon with the progress of the war. The aeroplane was in its initial stages of development during the World War, and there were no aero chemical attacks except the use of incendiary bombs. The possible means and methods of using gas as a weapon in a future war have been so greatly extended by the improvement of the aeroplane and other technical developments that it is reasonable to assume that in a future war the number of casualties from aero chemical attack will be tremendously greater than the gas casualties of the World War. The burden on the Medical Corps will be correspondingly increased. At this point it is essential to emphasize that by a casualty is meant a soldier incapacitated for fighting, not necessarily a death, nor even a seriously wounded man. With modern means of chemical protection there will be relatively few deaths or even serious wounds from gas but a multitude of lightly injured who will recover completely within several weeks. It is to be remembered that a wounded man is much more of a handicap to an army than a dead soldier. A dead soldier although lost to the fight requires no rations, needs no further care, while a wounded man on the average absorbs for weeks or months the activities of four attendants as his share of transpor-

tation, supply, hospitalization and other essential facilities. It is also true that, while the Medical Corps cannot do much to prevent casualties when bullets and high explosive shell are launched, it can do much toward preventing soldiers who have been exposed to gas from becoming casualties. Indeed the major portion of this burden of caring for numerous light gas casualties and for preventing gas casualties initially must be borne by the Medical Corps.

Are you, as civilian medical men and potential officers of the Medical Corps prepared to assume this increased burden with the brilliant success which marked your efforts in the World War? Much as I admire your past achievements and your potentialities, I question whether you are now prepared for your part in a war of the future in which chemicals will be largely used. Your peacetime training tended to prepare you for your World War duties where gas was not a dominant factor. The more extensive use of gas in a future war introduces medical problems for the solution of which your experience in civil life does not furnish adequate preparation. Have you given due consideration to what chemical warfare will mean to the medical profession in a future war? Have you directed your thought and training toward working out means and methods of handling efficiently the tremendous number of gassed patients who will tend to clog first aid, evacuation and base hospital facilities? Are we lagging behind the armies of the rest of the world in the preparation for this eventuality? These are questions vitally important to our national defense. It is true that the continuous threat of war in Europe spurs on their medical men to prepare for the day and that we lack this incentive to prepare. We, however, must not be lulled to a false sense of security by the blessings of our distance from the scenes of foreign strife nor by our ocean moats.

Immediately before the World War the science of chemistry and chemical industry had made great strides. One of the major participants in the war, Germany, led the

world in chemical science and in industry based on that science. After the Battle of the Marne there was a dead lock on the Western Front. Both sides were dug in, with approach to their underground shelters protected by barbed wire. Later on reinforced concrete was added. One flank was secured by Switzerland and the other by the sea. Maneuver was out of the question. The available technical and tactical resources of the soldier could not solve the problem. Strategy in so far as the Western Front was concerned had exhausted its possibilities. Professor Haber, dean of German scientists and head of the famous Kaiser Wilhelm Institute came to the rescue of Germany.

It is a fact of great historical and scientific importance that Professor Haber and chemical science had already saved Germany from certain defeat. A form of chemical warfare of far greater importance than gas warfare had already been put in operation in Germany by reason of Haber's knowledge and skill. War cannot be carried on without military explosives. Military explosives cannot be made without nitrogen. Before the World War the only known commercial source of nitrogen for explosives was the nitrate fields of Chile. With but a few months supply of nitrates on hand Germany in 1914 was cut off by the Allied Fleet from this source. Unless some other source of nitrates were made available, Germany would be inevitably compelled to capitulate. Haber invented and put into operation his process for the fixation of nitrogen from the air. Germany was thus saved by a chemist from certain defeat at this early stage.

Now, once more, Haber came forward and proposed a means for breaking the deadlock on the Western Front. It was to bombard the Allies not with high explosive shell but with molecules, which would sink into dugouts and trenches, shoot around corners and reach an enemy where the heaviest shells would be ineffective. From the huge forty two centimeter howitzers which had been so effective against Liege and Namur, he descended to the infinitesimally small, i.e. to molecules of chlorine gas. It may be noted that he selected a chemical which would not only be

effective on the battlefield but which was widely used in industry and was therefore commercially available in quantity

Professor Haber by considerable effort persuaded the conservative German General Staff to allow him to try gas as a weapon against the Allies to break the deadlock. The General Staff, however, being occupied with preparations for the Tarnow Gorlice breakthrough on the Eastern Front and uncertain as to the probable success of the gas attack, furnished second class troops and inadequate reserves and thus missed an opportunity of breaking through the Allied lines to the sea and of exploiting this breakthrough to achieve a decisive victory

Several thousand cylinders of this common industrial gas, chlorine, were installed in the trenches on a four mile front north of Ypres. At five o'clock in the evening of April twenty second, 1915, when the wind was right, these cylinders were opened and a cloud of chlorine gas drifted down over the two French Divisions in that part of the line. The Allied troops being without protection, either fled or were overcome. The German troops penetrated unopposed on a four mile front to a depth of three and a half miles into the Ypres Salient and then at seven thirty p.m., with their second class attacking troops mixed up and demoralized and without adequate reserves to give a forward impulse, the German troops settled down and entrenched. The Allies in their turn were so demoralized that they were unable to make the first counter attack until after midnight, seven hours after the German jump-off. But the Germans through lack of initiative, imagination and foresight had lost the golden opportunity. Thereafter throughout the war each side mobilized its chemists and industrial and military technicians to seek for effective war chemicals, means and methods of using them on the battlefield and means and methods of chemical protection.

For convenience in discussing the chemical agents used during the war it may be well to give you the system of

classification used by the Chemical Warfare Service  
Chemical agents may be classified as follows

- (1) Physiological effect
  - (a) Lung irritants (CL) (CG)
  - (b) Vesicants (HS) (MI)
  - (c) Lacrimators (PS) (CA)
  - (d) Irritant smokes (DA) (sternutators)
  - (e) Nerve and blood poisons  
(hydrocyanic acid)
  - (f) Others (physiological action incidental)
    - (1) Screening smokes (WP)
    - (2) Incendiaries (WP) (thermit) (oils)
- (2) Tactical employment
  - (a) Screening
  - (b) Harassing (lacrimators, irritant smokes and sternutators)
  - (c) Casualty (vesicants and lung irritants, plus white phosphorus)
  - (d) Incendiary
- (3) Explanation of abbreviations
 

CL=CHLORINE  
CG=PHOSGENE  
HS=MUSTARD GAS  
MI=LEWISITE  
PS=CHLORPICRIN  
CA=BROMBENZYL CYANIDE  
DA=DIPHENYLCHLORARSINE

After investigating possibly a thousand chemicals which gave promise of being suitable for use in war, about a score were actually tested on the battlefield. Of these latter the following proved to have important tactical value

#### (1) CHLORINE

Chemical name—Chlorine ( $\text{Cl}_2$ )

Physiological classification—lung irritant

Physiological action—burns upper respiratory tracts

*Historical Sketch* Chlorine first used in war by the Germans against Allied troops at Ypres, Belgium, April 22, 1915

## (2) PHOSGENE

Chemical name— Carbonyl chloride ( $\text{COCl}_2$ )

Physiological classification—lung irritant

Physiological action—causes edema

*Historical Sketch* CG was first made by John Davy, English chemist, in 1812, by reaction of CO with Cl in presence of sunlight Made with bone charcoal as a catalyst in 1915

CG was first used in war by the Germans against British troops in December, 1915, in cloud gas attacks mixed with chlorine

## (3) CHLORPICRIN (VOMITING GAS)

Chemical name— Trichloronitromethane ( $\text{Cl}_3\text{CNO}_2$ )

Physiological classification—lacrimator and lung irritant

Physiological action—lacrimates, irritates nose and throat, produces nausea and lung irritation in order as concentration increases

*Historical Sketch* Chlorpicrin was first prepared by the English chemist, Stenhouse, in 1848, by the reaction of bleaching powder and picric acid, also prepared by reaction of chloroform with nitric acid

PS was first used by the Germans against Italians in spring of 1917, on the Western Front

## (4) TEAR GAS

Chemical name—Benzonitrile ( $\text{C}_6\text{H}_5\text{CN}$ )

Physiological classification—lacrimator

Physiological action—causes severe lacrimation and nose irritation, temporary only

*Historical Sketch* This gas was used by French during World War as tear gas loaded in artillery shells

## (5) MUSTARD GAS (the most important of all war gases)

Chemical name—B<sup>1</sup> dichlorethyl sulphide ( $\text{ClCH}_2\text{CH}_2\text{S}$ )

Physiological classification—vesicant, blistering



Physiological action—dissolves in skin or lung tissue, then produces burns

*Historical Sketch* Mustard gas was first carefully investigated by the German chemist Victor Meyer, in 1886. It has been prepared and described by the English chemist, Guthrie, in 1860.

#### (6) ETHYLDICHLORARSINE

Chemical name—Ethyldichlorarsine ( $C_2H_5AsCl_2$ )

Physiological classification—vesicant and sternutator

Physiological action—vesicant, one-sixth as powerful as HS. A powerful sternutator.

*Historical Sketch* The Germans used this material as a filler for yellow cross No. 1 and green cross No. 3 shells during World War, 1,092 tons were made at Höchst and filled into these two munitions.

#### (7) SNEEZE GAS (DIPHENYLCHLORARSINE)

Chemical name — Diphenylchlorarsine  $C_6H_5AsClC_6H_5$

Physiological classification—sternutator, irritant smoke

Physiological action—sneezing, vomiting, headache

*Historical Sketch* Introduced into war by Germans in 1917. Several hundred thousand shells with this filling were fired against allies. Small bottle of gas in HE shell was used. Harassing effect of sneeze gas as well as effect of HE shell thus obtained. No deaths and relatively few serious injuries resulted from the World War use. It is particularly suited for temporarily incapacitating an enemy without doing him serious or permanent injury. This is the agent with which writers of horror tales wiped out the population of New York City.

#### (8) WHITE PHOSPHORUS

Chemical name—White Phosphorus ( $P_4$ ) (Yellow Phosphorus)

Physiological classification—none

Physiological action—solid particle burns flesh, smoke relatively harmless

*Historical Sketch* WP is a casualty agent, an incendiary and a smoke producer WP used during World War as a filling for 4" S M shells by British One thousand and six tons of WP made in United States during World War, 190 tons shipped overseas

### (9) THERMITE

An incendiary consisting of a mixture of iron oxide and aluminum Used largely as a shell filler and in aviation bombs

## WEAPONS USED TO PROTECT CHEMICAL WARFARE AGENTS IN THE WORLD WAR

(1) Cylinders of the type used in commercial life were first used When opened the gas drifted with the wind as a cloud of vapor This is a cumbersome and uncertain method and although used off and on to the end of the war was soon in the main superseded by some type of cannon to throw the gas in a container well into the enemy lines so as not to be dependent upon the wind

(2) The four inch Stokes mortar and the crude but effective Livens projectors were developed by the British to throw gas projectiles into the enemy lines These cheap, crude weapons were eventually adopted by all armies

(3) Gas in artillery shell was, however, by far the most important method of placing gas within an area occupied by an enemy Most of the gas attacks were made by artillery fire

(4) No chemical agents except incendiaries were put down by aircraft

## PROTECTION AGAINST CHEMICAL WARFARE

### General

"Protection is an essential factor in war For the individual the demand for protection springs from the fundamental instinct of self-preservation Man clings to life and seeks both instinctively and deliberately to protect himself to the last, even though he may, as he often does,

welcome great danger. It is the universality of this urge for life that makes acts of great individual sacrifice and heroism exceptional and causes them to be singled out and rewarded. In consequence of this the history of war might well be viewed as an age long and continuing struggle between weapon development, or the means of taking life, on the one hand, and protection, or measures for safeguarding life, on the other."

"The shield may be considered as the beginning of body armour, the development of which reached its zenith in the complete suit of mail of the medieval armoured knight. But with the Battle of Crecy in 1346 this form of individual protection received a definite check. The ultimate adoption of gunpowder for war purposes hastened the end. With the advent of breach loading firearms, emphasizing greatly the need for mobility and open formations, individual armour passed out of the war picture.

"Just as archery and firearms eliminated individual armour, so now is gas changing our ideas of the protective value of simple cover. Chemical warfare is indeed forcing material compromises in hitherto accepted rules of protection. Indeed places of natural cover against missile weapons are often those where chemical agents are most effective." In place of the metal armour protecting against cutting and thrusting weapons and projectiles, soldiers of the future must wear an armour of cloth impregnated with chemicals to neutralize the molecules of gas which threaten the body.

### Individual Protection

The fundamental item of equipment in protection against chemical warfare is the gas mask. Each contending nation developed during the World War a gas mask that protected face and lungs against the chemical agents then used. Each nation since the war has conducted research toward perfecting its mask to protect against all potential war chemicals. The principle of surprise has particularly important application here. A nation having in secret reserve a chemical agent that would penetrate

an enemy's mask but not its own, would have an overwhelming tactical advantage. As I shall show later such a discovery would be very difficult but not wholly impossible.

The results of research on agents and on improvements, particularly in the gas mask canister, are quite naturally carefully guarded secrets of the nation concerned.

The question of a reserve of gas masks not only for its army but also for its civil population is a problem given considerable attention in each European country.

The gas mask protects only the respiratory organs, the eyes and face. For the full protection of the body against the blistering action of vesicant agents, which, either in liquid or vapor form, will readily penetrate ordinary cloth, specially protective clothing is required. Such clothing, including protective gloves and shoes, will probably be issued in time of war by all armies. Impervious protective clothing which did not allow the passage of air but encased the body in an air tight compartment had a very limited use in the World War for troops who were to remain relatively inactive in a mustardized area or who were to wear the clothing for a limited period while demustardizing an area. For active troops, such as Infantry, impervious clothing is impracticable. Each nation is now seeking to develop a chemical with which uniform cloth may be impregnated allowing air to pass through, but filtering out the gas. The advantages of such a means of protection are obvious. It is probable that all armies in the future will be equipped with uniforms protecting against mustard gas while at the same time allowing the free circulation of air through the pores of the cloth.

### Collective Protection

Besides the means of individual protection measures must be taken to protect a group or a number of persons or animals against chemical warfare. In the World War we provided our soldiers with so called gas proof dugouts. The protection was in general inadequate. The probability of the more extensive use of gas in a future war has caused all nations to develop plans for the following

- (a) Gas proof shelters, not only for soldiers but for the population
- (b) Methods of removing gas from enclosed spaces
- (c) Method of decontaminating grounds, buildings, clothing
- (d) Protection of weapons and ammunition against mustard gas
- (e) Protection of food and water
- (f) Warnings of chemical attacks
- (g) Means and methods of first aid and hospitalization

One can readily see that there are some important and difficult problems here presented. The last one is of particular importance to the medical officer as well as to the civilian practitioner but all are of vital concern to the medical profession.

#### Gas Casualties in the A E F

A study of the casualties suffered by the American Expeditionary Forces may be made by examining the official report of the Surgeon General of the Army for the year 1920. According to this report, 258,338 men were wounded by war weapons. Of this number, 34,249 or 13.3 per cent, were killed outright or died on the field before they could be removed. The remainder, 224,089 wounded men, were removed to hospitals for treatment. Of the 70,552 gas casualties, only 1,221, or 1.73 per cent, died. Of the 153,537 admitted to the hospitals suffering from bullet wounds, shell wounds, and all other methods of warfare except gas, 12,470, or 8.12 per cent, died. Taking those that died from gas on the field of battle, estimated at possibly 200, and adding the 1,221 who died in the hospitals, there were 1,441 deaths in France from the effects of gas, which, considering the 70,552 hospital casualties produced by gas, shows that barely two per cent of the gassed cases died.

Of the remaining casualties, 187,586 who suffered from wounds other than gas, 46,519 or 24.8 per cent died, thus showing that the men who were injured by gas alone on the field of battle had in the American Army twelve times as many chances of recovery as those wounded with bullets, high explosives or other means. This figure for our Army

is slightly better than the British, due, no doubt, to the fact that the British Army experienced the gas attacks before devices for gas protection were devised

The ratio for the German Army was much more favorable to gas, i e., one to fifteen. This may have been due to a much higher state of gas discipline in the German Army. The more efficient the gas discipline and training the fewer the fatal casualties from gas. Defects in A E F gas discipline produced numerous unnecessary casualties.

### Does Gas Produce After Effects?

After noting how favorable the mortality statistics are for gas, many will raise the question of the dire after effects, blindness, tuberculosis and other lingering ailments. What is the use of having your life preserved if you are permanently disabled or a confirmed invalid? Such are the results of the horror literature, propaganda and failure to look at the facts objectively that the public at large does not know that gas produced relatively few after effects, while bullets and high explosive have dotted the landscape with pitiful derelicts.

### BLINDNESS DUE TO WEAPONS OTHER THAN GAS IN THE A E F

<i>Nature of disability</i>	<i>Rifle</i>	<i>Shell</i>	<i>Shrapnel</i>	<i>Hand Grenades</i>	<i>Gun Shot Miscellaneous</i>	<i>Others</i>	<i>Total</i>
Loss of right eye	13	40	89	6	64	6	218
Loss of sight							
of right eye	10	24	17	5	23	10	89
Loss of left eye	19	43	72	7	77	5	223
Loss of sight							
of left eye	6	14	27	—	17	2	66
Loss of both eyes	3	6	4	1	—	—	14
Loss of sight							
of both eyes	1	16	6	1	4	2	30
Loss of eye, side							
unknown	1	12	8	—	7	—	28
Loss of sight, side							
unknown	3	9	10	—	8	1	31
Loss of sight, due to							
other conditions	5	22	21	6	19	7	80
TOTAL	61	186	254	26	219	33	779
Blindness due to gas (4 per cent)							33
Blindness due to weapons other than gas (96 per cent)							779
TOTAL CASES OF BLINDNESS							812

## BLINDNESS DUE TO GAS

<i>Nature of disability</i>	<i>Kind of Gas</i>		
	<i>Unknown</i>	<i>Mustard</i>	<i>Total</i>
Loss of right eye	2	2	4
Loss of sight of right eye	7	5	12
Loss of sight of left eye	8	2	10
Loss of sight of both eyes	3	1	4
Loss of sight one eye, unknown	2	—	2
Loss of eye, side unknown	—	1	1
Total	22	11	33

## Does Gas Predispose to Tuberculosis?

Certainly if there is one error widespread and deep seated, it is that gas causes or predisposes to tuberculosis. It seems so natural to the layman that it should cause tuberculosis, that to eradicate this wrong belief is very difficult. It is a common belief on the part of the public that tuberculosis is a necessary consequence of gas poisoning. This matter came before a select committee of the United States Senate on investigation of the United States Veterans' Bureau in 1924. Dr. A. P. Franchine, whose testimony can not be ignored, was, previous to the war, associate professor of medicine at the University of Pennsylvania, where he taught largely on tuberculosis wards and from tuberculosis cases. For fifteen years he was visiting physician to the department of tuberculosis of the Philadelphia Hospital and on the staff of the Phipps Institute for the study and treatment of tuberculosis, and chief of the State tuberculosis clinic in Philadelphia from its foundation in 1907. Doctor Franchine went to France as division tuberculosis specialist, at first attached to the Twenty seventh Division, and later as consultant in gas to the Fourth Army Corps, where he was not only in touch with administrative and executive work in gas but assigned as chief of the staff at a gas hospital, a 1,000 bed hospital. Doctor Franchine, before the Senate committee, stated

"The percentage of deaths from gas was less than two per cent. And I went to the post mortem room every day and examined the lungs. I was not so interested in the effects of gas elsewhere, after I once knew it, but I examined the

lungs to see whether there were latent tuberculosis lesions, that is, lesions that do not give symptoms, such as any of us here may have, and whether there was any evidence of these lesions, pathologically, having been lit up by this more or less intensive inflammation. I do not mean at the time of the gassing but I mean following gassing, when one could expect it. While we were being rushed—and too rushed—to keep records I suppose I can say that I saw then 100 to 125 posts. In a number of these cases it was perfectly and palpably evident to a man of pathological training that there were healed, nonactive lesions, which is not an uncommon occurrence, as you know. It is considered that probably sixty to ninety per cent of people have at one time or another had a tuberculosis infection. But these palpable latent lesions showed no evidence of activity, or reactivation, from four to six to ten weeks after the acute inflammation which is supposed to give rise to tuberculosis." The consensus of medical opinion among those who have investigated the subject both here and abroad, is that gas has left no large aftermath of cases of tuberculosis among soldiers gassed in the war, nor are gassed cases in general predisposed to tuberculosis.

## CHEMICAL WARFARE DEVELOPMENT SINCE THE WORLD WAR

The principal of SURPRISE is of vital importance in chemical warfare. Each nation is carrying on research to anticipate any possible discovery by another nation of a chemical agent that will penetrate the present gas mask canister or otherwise overcome present means of gas defense. Such a discovery would tend to give victory to the nation making the discovery. Each nation is keeping secret the results of its research. We do not know, therefore, whether new and more powerful chemical warfare agents have been discovered since the World War. We do believe that the highly imaginative articles in current periodicals as to new discoveries and their effects are absolutely without foundation. It is probable that no chemical warfare agent more effective



for war use than mustard gas has been discovered since the World War. What we shall face in the next war, as I view it, is a far more extensive use of mustard gas than we experienced in the World War. This will mean tremendously increased burdens for the Medical Corps. The process of manufacturing mustard gas has been greatly simplified and cheapened. Vastly more of this chemical will be available for use than could be manufactured in the World War, and therefore we should concentrate on a defense against the extensive use of mustard gas in a future conflict.

### Incendiaries

White Phosphorus and Thermite were the incendiaries used during the World War. No important new incendiaries have been developed since the World War. A more extensive use of incendiaries will probably characterize a future war.

Smoke candles or smoke boxes had a limited use in the World War. A new and more efficient smoke mixture than that used during the World War has been developed. It is called the H C mixture, chemical name, Hexachlorethane ( $C_2Cl_6$ ) and Zinc Oxide ( $ZnO$ ). Liquid smoke materials for airplane smoke screens have been developed since the World War. Probably the cheapest and most effective consists of a mixture of Sulphur Trioxide ( $SO_3$ ) about fifty-five per cent and Chloisulphonic Acid ( $HCl\ SO_3$ ) about forty-five per cent.

### Aero chemical Attack

The principal post war development affecting the technique and tactics of chemical warfare is the development of the airplane and of the methods of aero chemical attack. These constitute far reaching and revolutionary changes. By means of the airplane no part of the enemy territory will be out of range of aero chemical attack. The great development in putting down chemicals is by sprinkling or spraying the same from aircraft, thus covering large bodies of troops or extensive areas in a short period of time and at any place in an enemy country. Mustard gas or irritating liquids

such as tear gas or irritant smoke will also probably be used to deny an area to an enemy by sprinkling the ground or surroundings using for this purpose sprinkling carts, military tanks or gas mines

The probability of the discovery of new and more destructive chemical agents for warfare is remote. The requisites of a chemical warfare agent are so exacting as to limit the field greatly. Laymen have a natural tendency to regard any potent toxic or irritating chemical as suitable for war use. The facts belie this as evidenced for example by hydrocyanic acid, deadly in the laboratory but not usable on the battlefield, as proven by most extensive tests by the French Army. When you have noted the exacting minimum requirements for chemical warfare agents, it will be apparent why the field is very limited.

#### Exacting Requirements for a Chemical Warfare Agent

A substance, to be useful as a chemical agent, must have all of the following properties

(1) It must be very toxic, or very irritant, or produce a large volume of smoke, or have incendiary properties

(2) It must be stable in storage and reasonably stable in contact with moisture

(3) It must be capable of manufacture on a large scale

(4) Raw materials must be available in the continental United States

(5) It must be suitable for loading in munitions and should have little or no corrosion on ordinary steel

(6) The substance must be capable of vaporization, or other means of dissemination, in sufficient concentration under field conditions to produce the effect desired

(7) If the substance is a gas under ordinary conditions, it must be easily compressed to a liquid and easily vaporized when the pressure is released

In addition to the above absolutely necessary properties, it is highly desirable that a chemical agent possess the following properties

(1) It should be capable of handling and transportation without special precautions

(2) When disseminated as a vapor the molecular weight should be several times as great as air

(3) It should be cheap to manufacture

(4) It should be capable of quick production in existing commercial plants without extensive alteration in existing equipment

Is It Practicable to Make Effective the Prohibition of Chemical Warfare? I believe you will concur with the committee appointed by the League of Nations Assembly to consider this question, that the answer is, No

The committee reported

a "Although conventions forbidding the use of gas in time of war might have great moral value, yet no treaty stipulation could certainly prevent secret preparation for chemical warfare. There is only too much reason to fear, after the experience of the late war, that any country fighting for its life will avail itself of whatever weapon it may find it possible to use effectively. It is therefore necessary, however unfortunate it may be, to anticipate if another war breaks out, chemical weapons will be used

b "That it is impossible to prohibit or control research which could lead to further discoveries—or to restrict the manufacture of a gas or particular gases"

c "It is to be feared that chemical weapons will be employed by belligerents to a still greater degree in the future than has been done in the past, for these weapons have shown themselves to be efficacious under circumstances where other arms have been of little or no use"

The United States Is Not A Party to Any Treaty Now In Force or Restricting the Use of Chemicals in War. We have taken part in so many conventions on this subject that even the military mind is confused as to just where the United States stands on this question

For purposes of clarification the following is quoted from The War Department Manual on Military Law

"The United States is not a party to any treaty, now in force, that prohibits or restricts the use in warfare of toxic or nontoxic gases, or of smoke or incendiary materials, etc. A treaty signed at Washington, February 6, 1922, on behalf of the United States, the British Empire, France, Italy, and Japan (Malloy, *Treaties*, Vol III, p 3116), contains a provision (art V) prohibiting "The use in war of asphyxiating, poisonous or other gases, and all analogous liquids, materials, or devices", but that treaty was expressly conditioned to become effective only upon ratification by all of the signatory powers, and, although heretofore ratified by all of the signatories except France, having never been ratified by the latter, has never become effective. The protocol "for the prohibition of the use in war of asphyxiating, poisonous, or other gases, and of bacteriological methods of warfare", signed at Geneva June 17th, 1925, on behalf of the United States and many other powers (*League of Nations Official Journal*, Aug 1925, p 1159), although ratified or adhered to by, and now effective as between, a considerable number of the signatories, has never thus far been ratified by, and is not in force as to, the United States, Japan, and some other powers."

Is It Probable Our Medical Officers will Be Called Upon to Protect Our Army and Civil Population Against Bacteriological Warfare? This is a question that has not only been raised by sensational horror story writers but by far-sighted Medical men both military and civilian. An international commission consisting of Professor Pfeiffer (Breslau), Bordet (Pasteur Institute), Madsen (Copenhagen) and Cannon (Harvard) appointed to investigate this subject, reported to the League of Nations in 1922 essentially as follows

a The effects of bacterial injury cannot be limited or localized

b Modern water purification methods protect against the organisms of typhoid and cholera

c Plague is a disease that would be as dangerous for the force using the organisms as for the attacked

*d* The danger from typhus has been exaggerated

*e* Modern sanitary methods are effective in controlling communicable diseases

*f* Bacterial warfare would have little effect on the actual issue of a contest in view of the protective methods which are available for circumscribing its effects

*g* As regards the poisoning of weapons, the experts point out that the germs which could be employed (streptococci, anthrax spores, glanders bacilli, etc.), would not preserve their danger properties if they were prepared a long time beforehand and allowed to dry on metallic surfaces. Nor if placed in a projectile would these germs better resist the shock of discharge, the rise of temperature and the violence of an explosion which destroys all life. The only method presenting a certain danger would be that of dropping from aeroplanes glass globes filled with germs. The majority of experts are of the opinion that bacteriology cannot at present produce effective substances capable of destroying a country's live stock and crops.

A reasonable conclusion from the report of this Committee of Experts of the League of Nations is that no nation, however ruthless, would probably resort to bacteriological warfare because of the technical difficulties involved and because the danger to its own people would be so great.

## CONCLUSIONS

1 There is no practicable way of prohibiting or regulating chemical research or the development and manufacture of war chemicals because they are either the chemicals of industry or closely allied thereto.

2 Chemical warfare as evidenced by the World War statistics is the most effective method of using force yet devised by man, with relatively slight destruction of life and property and the minimum of human suffering and after effects. Propaganda and sentimental considerations deny this. An objective study of the facts confirms the truth of the statement.

3 Chemical warfare will be an important weapon in a future war. In the history of warfare no effective weapon once adopted has ever been abandoned until rendered obsolete. Chemical warfare is decidedly effective.

4 The mathematical probabilities are against the discovery of new and more powerful chemical warfare agents. However, continuous research must be carried on as part of an efficient National Defense organization.

Future developments in chemical warfare lie along the lines of more effective use of the agents already known and more effective means of protection against the same.

5 By reason of the abundance of the raw materials required in its manufacture (table salt, water, coal, sulphur and alcohol), the development of the technique of manufacture on a large scale by most countries and the tactical value of the agent, mustard gas will probably be the most important chemical warfare agent in a future war. But the effect on tactics and on the functioning of the Medical Corps will be marked.

6 Mustard gas in the future will produce far more casualties than were produced by any weapon in the World War but they will be light, with few deaths, relatively little suffering and relatively negligible after effects.

7 Until a volatile vesicant is discovered, gas warfare as it stands today and as it will stand in the future, is a more powerful defensive than offensive weapon. This fact arises primarily because mustard gas and similar gases, can be used to make difficult the occupation of or passing over terrain. Hence, it can always be used by a retreating force or by a force on the defensive, whereas, its use by force on the offensive would tend to block the progress of the army using the gas. This does not mean that an attacker would be absolutely precluded from using mustard gas on an enemy area and then attacking through the area. This might well be a sound maneuver particularly if the attacker was well equipped with protective clothing which the defender lacked.

Care should be taken to avoid absolutes in the discussion of chemical warfare and to deal in relative terms. Mustard gas would be a great obstacle to the landing of troops.

While as now used by aeroplane, artillery, or other weapons, mustard gas is more valuable as a means of defense than of offense, the discovery of a gas of the mustard type but which was volatile and quick acting might readily reverse this situation. We must be prepared mentally and technically for rapid changes in conditions of warfare.

8 The United States is the only country in the world that by reason of its industrial development and natural resources has all the manufacturing capacities and all the raw materials (or substitutes therefore) for carrying on any type of chemical warfare.

9 Our national military policy is solely one of defense for which the chemical weapon is peculiarly suited. The question asked by Dr. Mills, Professor of Chemistry in the University of South Carolina, is pertinent:

"Shall we solemnly set forth that certain chemical compounds shall not be used to defend those that discovered them? Shall we insist that with cheap and effective weapons at hand, the cheap and effective weapons should be discarded and that a more expensive (and, as a matter of fact, more brutal) armament should be maintained?"

10 Armor, not against cutting or thrusting weapons or metal projectiles but against molecules, will characterize troops of the future. Uniform clothing must afford protection against blistering gas while allowing free circulation of air. Any army not so equipped will certainly go down in defeat before an otherwise equal force with protective clothing and means of spraying mustard gas. Troops without protective clothing would find difficulty operating even in tear gas spray, particularly on a hot day.

11 Weapons, tools, etc., sprayed with mustard gas can not be used until decontaminated. Food and water must be protected from the spray. These present important problems in equipment and training not yet met by our Army.

12 Chemical warfare as evidenced by our World War experience is not a menace to civilization but the contribution of science toward halting the destructiveness of war.

13 Aeroplanes and chemical warfare give to a nation a powerful means of defense in time of emergency without serious expenditure in time of peace. This means national security without large national armaments, thus making for the future peace of the world.

14 The Medical Corps has an important problem not only in caring for gas casualties but in preventing their occurrence. This requires a very considerable training and knowledge not now possessed by the Corps in general.

15 I would emphasize that all which I have previously said seems to lead logically to the conclusion that an otherwise most efficient national defense system may be rendered nugatory without chemical warfare preparation, and as yet we have not made this preparation.

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(Decontamination of streets, buildings and their contents, vehicles and plant) Published by His Majesty's Stationery Office, London
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## A REVIEW OF "AMERICAN MEDICINE"

Were we to attempt to characterize in two phrases this remarkable study of the economic phase of the practice of medicine, complete unity of purpose and utter diversity of opinion would perhaps express our primary summation. For he who opens this book with the expectation that he will here find a crystallization of the thought of American Medicine, an evaluation of countless varieties and shades of belief, will be vastly disappointed. The editors at once disclaim any attempt to harmonize so many and so divergent opinions. The reason for this disclaimer is perfectly obvious for it is utterly impractical to derive a creed from so many and so different credos.

The American Foundation Studies in Government, which sponsors this inquiry, the Medical Advisory Committee and the Editor have, we believe, approached this study objectively and fairly. The possible difference in attitude between these and the contributors is that the Editors have entered upon this study with a definite purpose and possibly with preconceptions, whereas the medical men with equal desire to arrive at a just solution are manifestly bewildered and present no semblance of a united front.

In a foreword, Mr. Curtis Bok explains the method of research in these words:

"Indeed, we have developed a technique whereby not we but the competent or especially interested groups really do the researching—by which I mean to say that we attach no final value to our personal conclusions, except to the degree to which they are checked and supplemented by the groups throughout the country especially competent to have opinions and information, and to exercise judgment, in a given field. Our procedure is to present problems to competent groups and then to define the problems comprehensively by assembling all the factors brought forward in the free discussion that follows. We do evaluate the ideas, but under stern challenge from our collaborators."

The Chairman of the Medical Advisory Committee, Dr Truman G Schnabel, in a brief introduction says in part

"As in the case of other studies of the American Foundation, the study of the relation of government to health was begun with no assumption either that government should, or that it should not, play a larger part than it now plays in the administration of public health activities, or, so far as the individual citizen is concerned, in the organization of medical care

"The health study was brought to the fore in our active program, was singled out from other subjects of our research for more intensive consideration both in the research and in the technique of invoking the opinion of selected groups among the public, because the situation seemed to us to be singularly in need of clarification

"There is a group that believes there are too many physicians and a second group that believes there are too few, and a third group that believes there are too many bad physicians and too few good ones, and a fourth group that believes this whole question is beside the point and that the real need is to insure that every physician licensed to practice is a good one, in which case the law of supply and demand will ultimately operate to control numbers satisfactorily

"There are proposals for radical change, on the one hand, and tightly knit defense of the status quo, on the other. There are those who are for revolution and those who are for evolution. There are those who are against revolution, and—yes—those who are against evolution and who become apoplectic at mention of need of any change, however minor

"The whole question is agitated in one quarter as a purely economic problem, in another as a social, in another as a purely professional and scientific. Few indeed have had the vision to see that all these aspects are involved and that no solution resting on only one of these bases and made without reference to the rest can be serviceable

"Of outstanding interest to us in the whole project has been the fact that medical scientists, when asked whether change is needed in the present manner of organizing medical care and of planning for the health of the population, tended to reply not by theoretically discussing social and economic proposals but rather by practically analyzing concrete ways and means of advancing medical science, raising the standards of medical practice and improving medical education"

In our own opinion the Editor here touches upon the most significant and impressive thought derived from an understanding reading of these pages. One finds here a composite picture of the doctor, unconsciously etched by himself. It is in essence an authentic etching and is in fact the only unity found in this bewildering assemblage of diverse opinions, though it comes from doctors in every section of this great land, engaged in every type of city and country practice and in every form of endeavor within the medical profession. As we see it, the outstanding features in this self-drawn portrait are the desire to advance and disseminate knowledge of medicine and to provide adequate medical service for the people.

The report includes chapters on the following subjects

- Is Adequate Medical Care Now Available
- General Principles that should Underlie the Organization of Medical Care
- Medical Education
- Specialization
- Group Practice
- The Place of the Hospital
- Public Health Organization
- Experimentation—State, County and Community Plans
- State Medicine
- Health Insurance, Compulsory, Voluntary, Hospital, Industrial
- Limited State Medicine and Private Practice

In each chapter numerous individual opinions are quoted, chiefly illustrating editorial summation of group beliefs. By this means, the Editor is to a certain degree successful in regimenting ideas so that twenty one hundred individuals are arranged in companies and battalions. This most difficult editorial feat is accomplished with fairness as well as dexterity, yet it must be admitted, the Editor has been well advised in warning us that no conclusions can be based with integrity upon so many variants.

Despite the confusion of mind occasioned by so great diversity, there is a remarkable assembly of opinions upon every phase of medical practice which will be of inestimable value in solving the difficult problems now confronting the profession. This report merits careful study not alone upon the part of the medical profession, but by all persons concerned with the vital social and economic problems of the American people. The very confusion which this presentation reveals, serves to accentuate its complexities and interrelations with many fundamental entanglements in our present social system. A study of this report will also tend to clarify the minds of doctors on this most significant subject.

The report which is in two volumes of 1400 pages merits and requires careful study to gain a true appreciation of its great worth. In addition to throwing much light on the principal subject, it constitutes a most valuable reference book by providing interesting side lights on almost every phase of medical practice.

The sponsors, the Editors and the contributors may well be proud of this achievement.

M A



## LIBRARY NOTES

### DEATH OF MR LEONARD L MACKALL

#### Consultant in Bibliography

It is with deep regret that we announce the death of Mr Leonard L Mackall, at the age of fifty-eight, which occurred on 19 May at Fredericksburg, Va His health had not been of the best lately, but his many friends were surprised to hear about two months ago that he was stricken with a severe illness He was born at Baltimore 29 January, 1879, and was educated at Lawrenceville School, Johns Hopkins University, where he obtained his A B in 1900, and at the Harvard Law School which he attended for two years He forsook the law and devoted himself to literature which he studied at the University of Berlin for another two years, became a Fellow of Johns Hopkins University in 1906, and then returned to Europe for work at the University of Jena From 1916 to 1918 he was Librarian of, and did extraordinarily good work at, the De Renne Georgia Library at Savannah where he lived In 1921 he became editor of "Notes for Bibliophiles" published in the "Books" section of the Sunday issue of the *New York Herald Tribune* He continued in this position till his last illness and his scholarly "Notes" were read week by week with avidity by book-lovers

Mr Mackall was a member of many learned societies, including the Bibliographical Society, the American Antiquarian Society, the Grolier Club, the American Historical Association, the History of Science Society, the American Association of the History of Medicine and, at the time of his death, was President of the Bibliographical Society of America and the Georgia Historical Society

His bibliographical learning was truly wonderful and it seemed that he knew the great books and the less important ones in all branches of knowledge His correspondence must have been enormous, and who is there that received his letters in answer to an inquiry, who will forget the closely packed typewritten page, with important facts

underlined or put in red? Usually there was a postscript placed at the top because there was no room at the bottom! He had an uncanny memory so that not only did he know an author's works and the various editions and indexes and supplementary volumes—often forgotten by some authorities—but he could tell you the wanderings of special copies, their former owners and the sales they had passed through. All this was at his fingers' ends and he would recite it to you over the telephone with all the necessary dates, should you call him up to ask a question. I have known him to go into a library or a book shop at Oxford, set up his typewriter on a tripod before the shelves and write note after note seemingly about any books which he took down. Who else in the world could do that?

Mr Mackall's bibliographical first love seems to have been Goethe—his correspondence especially. Then one day about 1900 at Baltimore, his friend Dr W W Francis, mentioned that Dr Osler had just acquired the big volumes of Lavater's *Essays* (1789-1810), knew next to nothing about him, and was waiting for an opportunity to look him up. Whereupon, as Dr Francis informs me, Mr Mackall, replied, "I know all about him, he was one of Goethe's correspondents, let me see the books." "Come along", said Dr Francis, and that was Mr Mackall's introduction to Osler. Osler promptly nicknamed him "Lavater", in his kindly, playful fashion. And so Mr Mackall became a medical as well as a general bibliographer, it is his interest in medical books that concerns us here. Soon no one knew as much about the martyr Michael Servetus and his works as Mr Mackall. He was one of the four men to whom with Lady Osler was entrusted the completion of the catalogue of Sir William Osler's library, *Bibliotheca Osleriana*. Oxford at the Clarendon Press, 1929. As was the case with many other libraries, this one was much enriched through him by many gifts of rare books, and odd out-of-the-way items—and a great number of notes. It is largely owing to him that the Servetus collection, to mention only one section of the Osler Library, is so fine. His first published bibliographical contribution to the subject



of Servetus appeared under the modest title of "Servetus Notes" in *Contributions to Medical and Biological Research Dedicated to Sir William Osler, Bart*, New York, Paul B Hoeber, 1919, vol II, pp 767-777 This was followed by an article entitled "A Manuscript of the 'Christianismi Restitutio' of Servetus, placing the Discovery of the Pulmonary Circulation Anterior to 1546", *Proc Roy Soc Med*, London, 1923 24, (March, 1924), vol XVII, Hist of Med Sect, pp 35-38 Another of his notes on medical works is contained in a letter to the *Journal of the American Medical Association*, 24 Feb, 1923, vol 80, pp 572-573, entitled "The Earliest Recognition of Appendicitis—Again" Mr Mackall had presented both the German original and the English translation of Heister to the Osler Library

After Sir William Osler's death, Mr Mackall read a tribute to him in a paper entitled "Sir William Osler", *The Papers of the Bibliographical Society of America*, vol XIV, Part 1, 1920, pp 20-32, Chicago [1922] When the Osler Library was opened at McGill University, he devoted one of his articles to it, "Dedication of the Osler Library", *New York Herald Tribune, Books*, 16 June 1929 Also with Fielding H Garrison, Harvey Cushing, and E C Streeter, he revised and corrected galley proofs of Osler's *The Evolution of Modern Medicine* for publication by the Yale University Press, New Haven, 1921 (second printing 1922)

Many are the stories of his literary "finds" in the catalogues of second hand booksellers who did not know the rarity of some of their items, or through visits to book shops At the sale of John Sargent's books, he bought the very volume of Petrarch's *Opera* (1515) which Dr Welch is fingering as it lies on the table in that artist's well known portrait of the *Four Doctors* He graciously presented it in 1927 to the Tudor and Stuart Club of Johns Hopkins University—he knew the interest and value of "association" copies Not a rich man himself, the richness of his generosity was extraordinary I am sure he often

bought books merely to make gifts of them to enhance the extent and value of another man's collection, or if he heard that someone lacked a certain volume, he would take it out of his own library (numbering some twelve thousand items), and give it away. Remember that often he had never met his brother collector or seen the library to which he made the gift, perhaps away off in Europe. And, imagine the astonishment of the recipient on obtaining a long sought treasure out of the blue sky, as it were! Even if it meant giving it up himself, or asking another man to do so, Mr. Mackall believed that every book should be placed where it would be most appreciated, most useful, and therefore most valuable. One of the happiest days of his life must have been that of 17 October, 1929, when the William H. Welch Medical Library, named after his great friend, was opened at the Johns Hopkins University. With a most characteristic speech, abounding in relevant bibliographical detail, which he called "Six Books" (*Bulletin of the Johns Hopkins Hospital*, Jan. 1930, vol. xlv, pp. 83-90), he presented the six treasures to the Library. It seemed that he did not have time or the inclination to compile bibliographies himself, perhaps because he spent most of his day helping others.

In 1926 Mr. Mackall was of the greatest help to me in choosing books to show at our exhibition, a catalogue of which was printed with the title *Catalogue of an Exhibition of Early and Later Medical Americana*, N. Y., 1926. He also aided very much with the brief notes which accompany the list. He was always meticulously exact in writing bibliographical references and his advice was to make them even more detailed than seemed necessary, for instance, he liked to include the month of publication of a magazine. He was not overly strict about the order in which facts were given, provided the whole reference was clear.

We continued to make much use of his knowledge and never did he exhibit the slightest reluctance to help, when he aided us in the Rare Book Room, as Miss Annan puts it, he did it simply and with no effort to impress one with his knowledge. It was a red-letter day at the Academy when

he paid one of his occasional visits—they would have been more frequent, but during the past few years he was in New York for but short periods at a time. He advised us about the purchase of volumes and presented others to the Library. Through his help we acquired many reference works and we have never ceased to be grateful to him for telling us of the two volumes of the *Subject-Index of the London Library*, 1909 and 1923.

In 1932, when Dr. Samuel W. Lambert had completed an account of the initial letters used in the great anatomical work of Vesalius, Mr. Mackall told him that Roth had written about the wood blocks found at Munich, (*Arch f path Anat* [Virchow's] 1895, Bd 141, pp 462-478), and so came about the volume for our "History of Medicine Series", *Andriæ Vesalii Icones Anatomicae*. He reviewed this volume in an article entitled "Vesalius Illustrated" in *New York Herald Tribune Books*, 22 December, 1935, and added a correction in the issue of 29 December. Just a short time ago, reading by chance of a list of errata which was published for the *Dictionary of National Biography*, I inquired of him and was delighted that he knew all about it. We succeeded in buying a copy so we now have a valuable addition (I think known to comparatively few) to that invaluable work of reference. One of his last kindly acts was to consent to read over and criticize the manuscript of Miss Janet Doe's *Bibliography of the Works of Ambroise Paré*, which is being published for our "History of Medicine Series" by the Chicago University Press.

We were all delighted when in 1930 he consented to become Honorary Consultant in Bibliography to the Academy. By so doing, he honoured us. We have suffered the loss of a wise and generous friend, but he has left behind an example of all that is best in bibliography.

ARCHIBALD MALLOCH

## A SELECTION OF RECENT ACCESSIONS

"Possession does not imply approval"

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# OFFICERS OF SECTIONS, 1937-1938

## *Dermatology and Syphilology, 1st Tuesday* *Chairman Secretary*

LOUIS CHARGIN HARRY C SAUNDERS  
 1 West 85 Street 159 West 87 Street

### *Surgery, 1st Friday*

RODERICK V GRACE FRANK L MELENEY  
 100 East 66 Street 180 Ft Washington Avenue

### *Neurology and Psychiatry, 2nd Tuesday*

IRVING PARDEE MORRIS GROSSMAN  
 160 East 64 Street 66 West 87 Street

### *Historical and Cultural Medicine, 2nd Wed of Nov Jan, Mar and May*

RIGINALD BURBANK HOWARD R CRAIG  
 6 East 78 Street 175 East 79 Street

### *Pediatrics, 2nd Thursday*

SAMUEL Z LEVINE PHILIP M STIMSON  
 N Y Hospital, 525 East 68 Street 25 Claremont Avenue

### *Ophthalmology, 3rd Monday*

JAMES W WHITE RUDOLPH AERLI  
 15 Park Avenue 30 East 40 Street

### *Medicine, 3rd Tuesday*

JOSEPH HANIK THOMAS T MACKIE  
 555 Park Avenue 16 East 90 Street

### *Genito-Urinary Surgery, 3rd Wednesday*

EDOR L SENTER JOHN A TAYLOR  
 112 Joralemon Street Brooklyn 2 East 54 Street

### *Otolaryngology, 3rd Wednesday*

CHARLACE H SMITH JAMES W BARCOCK  
 110 East 54 Street 20 East 53 Street

### *Orthopedic Surgery, 3rd Friday*

EARL E VANDERWERKER JOSEPH B L'ETESCOPE  
 733 East 43 Street 177 Lafayette Avenue, Brooklyn

### *Obstetrics and Gynecology, 4th Tuesday*

THOMAS E LAYTL EDWARD H DENNEN  
 1 East 63 Street 133 East 80 Street

## AFFILIATED SOCIETIES

### *New York Roentgen Society (Affiliated) (3rd Monday)*

LEOPOLD JACHES, *Chairman* R W IRVING, *Secretary*  
 100 East 94 Street 115 East 61 Street

### *Society for Experimental Biology and Medicine,* *(Auspices of Academy) (3rd Wed)*

PHILIP E SMITH, *President* A J GOLDFORN, *Secretary*  
 630 West 168 Street City College, Convent Avenue and  
 139 Street

### *Harvey Society (Affiliated) (Gives 2nd Acad Stated Meetings, 3rd Thurs)*

EUGENE L OPIE, *President* MCKEN CATTELL, *Secretary*  
 Cornell Med Col, 1300 York Avenue Cornell Med Col, 1300 York Avenue

### *New York Pathological Society, (Affiliated) (4th Thurs)*

N CHANDLER FOOT, *President* MILTON HELIFERN, *Secretary*  
 N Y Hospital, 525 East 68 Street 400 East 29 Street

# BULLETIN OF THE NEW YORK ACADEMY OF MEDICINE

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## THE SCIENTIFIC WORK OF THE HEALTH ORGANIZATION OF THE LEAGUE OF NATIONS

THORVALD MADSEN

Harvey Lecture, February 18, 1937

A remarkable feature of the Versailles Treaty was that it contained a paragraph providing that the members of the League agreed to, "take steps in matters of international concern for the prevention and control of disease"

Thus, for the first time in history, those who drew up an important political treaty gave some thought to the health of the nations

Shortly afterwards, the new international Health Organization was established and began to function. Today it is composed of

- 1 A Health Committee of twelve members, one of whom has always been an American, which now meets four times a year
- 2 An Advisory Council, consisting of the permanent committee of the Office International d'Hygiène Publique in Paris, which convenes annually an international health conference to consider the League's health work
- 3 The Health Section, the executive organ of the Health Organization, which is an integral part of the Secretariat of the League

The funds for the Health Organization's work are derived mainly from the League itself but ever since 1922 the Rockefeller Foundation has made generous grants and the Milbank Memorial Fund has supported certain activities



Among the many and widely diversified activities of the Health Organization during the sixteen years of its existence I shall give you an account of some of the fields in which it has made use of scientific workers and institutions and has consequently contributed to scientific progress

It must be remembered that the Organization confines itself to work of a practical nature and does not undertake any purely speculative research. It does not itself deal with practical health problems unless they are in international in character, by reason either of the nature and extent of the investigations required or of the measures necessary to control epidemics.

The question has been raised as to whether the League should itself create a big central laboratory for research into the many different problems requiring solution but this idea has been rejected, as it has been found much more profitable to coordinate the work of national institutes and experts who are particularly interested in the problems to be investigated.

#### *International Cooperation in the Campaign Against Epidemic Diseases*

One of the main activities of such a body as the Health Organization must obviously be the campaign against those infectious diseases which constitute essentially international problems.

The first condition for a campaign against infectious disease is the creation of a service of epidemiological intelligence and public health statistics. The League has created two such services, one with its headquarters at Geneva the other at Singapore. At Geneva current information is collected from all the Government Health Services on the prevalence and movement of infectious diseases and is then classified, analyzed, and published in weekly, bi monthly and yearly bulletins, as well as in multi-graphed sheets appearing several times a week. These are at the disposal of all the Health Administrations in the world. While medico statistical material of considerable

able value has been compiled in this way, it is of particular importance that the Bureau in Geneva should be well informed of the conditions under which these data have been compiled. Were such information lacking, the value of the figures would be open to doubt. One difficulty has always been to establish uniform figures, data which may be comparable, for instance, on the questions of still birth, population estimates and the notification of joint causes of death. In order to achieve uniformity and comparability in connection with this information, it has been necessary to create several commissions of statistical experts, who have considered these questions and made definite proposals to the Health Administrations.

The first successes achieved by the League in the collection and transmission of epidemiological intelligence were due to the foresight, wisdom and initiative of Edgar Sydenstrucker. We are also indebted to Dr. Boudreau for very valuable work in this field. At present the decennial revision of the International List of Causes of Death is under consideration, and the French Government, which will convene the next conference, has entrusted its preparation to a joint committee set up by the International Institute of Statistics and the Health Organization of the League of Nations. Dr. Haven Emerson of Columbia University is the American member of this committee.

In Singapore the League of Nations Bureau now collects information from all important ports in the Far East and distributes it again to all ports and ships by ten wireless stations and by cable.

For the study of infectious and other diseases it has been found necessary to constitute a series of Expert Commissions, and this method of work has proved to be very satisfactory. Meetings of scientists at congresses often prove very helpful through personal contacts and the many new suggestions to which they give rise. On the other hand, tangible results are often scanty because the necessary complete cooperation on definite points cannot always be maintained. The position is more favorable in the case of the Commissions created and maintained by the League. The

intention is to elucidate a difficult question and treat it in such a way that a concrete proposal may result. If at the first meeting the information available is not sufficient, it may be necessary to carry out thorough investigations either in the field or the laboratory in accordance with a definite plan. On the termination of these investigations the participants will often be in a position to make definite practical proposals on which the Health Administrations can base their work. A long series of such Expert Commissions has been constituted dealing with practically all important infectious diseases.

### *Tuberculosis*

I need not weary you by entering into the work of all these different Commissions but only mention by way of illustration some of the more important. Take, for instance, *tuberculosis*. A thorough investigation into the epidemiology of tuberculosis was made in the three Scandinavian countries in 1925, showing the very different manner in which tuberculosis has developed in these countries. In Denmark, for instance, tuberculosis has been spreading for a hundred years and this is probably one of the reasons why it is now decreasing rapidly. Practically the whole population in all parts of the country have been infected and consequently immunized, whereas in Norway and Sweden the spread to the more remote parts has taken place more recently, and the tuberculosis rate has shown a tendency to rise up to a few decades ago.

Another question is that of tuberculin. On the proposal of Calmette and Potter a standard tuberculin was prepared and suggestions put forward for the best way of carrying out the tuberculin test. When the well-known method of vaccination against tuberculosis was recommended by Calmette and Guérin, it encountered, as will be remembered, severe criticism, even before the sad Lubeck affair. Doubt was raised both concerning the immunizing power and the innocuousness of the vaccine. A Conference of leading experts in tuberculosis was convened at the Pasteur Institute under the auspices of the

League, and after very thorough discussion a report was adopted stating that BCG correctly prepared, could be used without any risk

### *Tubercle Bacilli in the Blood*

Some years ago a considerable controversy was raised in the scientific world because the Austrian tuberculosis expert, Lowenstein, thought he had demonstrated that virulent tubercle bacilli could be found in the circulating blood not only of patients with tuberculosis but also in patients suffering from many other diseases, such as dementia praecox, mental diseases and rheumatic affections. This thesis was denied by several competent workers, but others supported Lowenstein's idea. This gave rise to considerable confusion in the scientific world, since Lowenstein's thesis, if correct, constituted a total revolution in our conceptions of tuberculosis and its significance for the etiology of some of our most common diseases. It would, for instance, also revolutionize our present use of blood transfusion, because we could not be indifferent to the fact that by transmitting blood from an individual apparently not suffering from tuberculosis to another, there would be a risk of transferring tuberculosis infection. As this matter had not only a scientific but a practical significance, our Health Organization was approached with a view to a really authoritative investigation of the problem. Four competent laboratories were chosen, that of Stanley Griffith in Cambridge, of Calmette in the Pasteur Institute in Paris, of Kolle in Frankfort and of the Serum Institute in Copenhagen, department of K. A. Jensen. Blood samples from a series of selected patients were taken, half of which were examined in the country in question, and the other half sent to the laboratory of Lowenstein. Finally this research work was concluded and the results discussed, and I may say that not one of these four investigators could confirm Lowenstein's thesis. As a result of this investigation the general impression of specialists in this field is that the whole question has fortunately been settled.

Though the problem of stamping out tuberculosis is far from solution, yet this disease is decreasing rapidly in many countries. Such is not the case with a disease such as syphilis, which should be completely eradicated with the help of modern treatment.

### *Syphilis*

The important Bordet-Wassermann test has played a very great role in the fight against syphilis. In view of the great significance of this test, and the fact that it is used by so many workers in different countries, considerable modifications have been suggested, concerning the "complement fixation" test as well as the "precipitation" tests. Some uncertainty was felt as to which of these tests was preferable. In spite of the extensive literature on the subject, it was impossible from these publications alone to form an objective judgment on the relation between the different tests as every author of a test strongly held that his was superior to the others. After some preliminary investigation, it was clear that the only useful method for comparison would be to invite these authors to a laboratory conference where they could perform their own tests on identical samples of blood and compare their results. Two such laboratory conferences were held in the State Serum Institute in Copenhagen in 1923 and 1928 and the results were exceedingly enlightening.

Only by such a conclusive experiment could a really objective comparison between the tests be made, and only after having been faced with these indisputable results would the authors eventually concede the inferiority of their own methods. The value of these conferences was so great that the South American States asked the League to convene a third in Montevideo in 1930. The result of these conferences was that the "precipitation" tests of Kahn and others as a whole were found to be superior to the "complement fixation" methods, but it was shown that both should be used together. Since that time the authors have improved the "complement fixation" test with the

result that they now have an equivalent value. At present, there is a general desire to have a new laboratory conference in order to obtain exact information on the present state of these important tests.

I should like to emphasize how useful such laboratory conferences may be. They not only give an opportunity for reliable comparisons between the methods tested, but the many exhaustive discussions between the experts have often induced them to return to their respective countries anxious to overcome the deficiencies of their methods.

The best method of treating syphilis was a problem of a different character. As the Salvarsan treatment is capable of rendering a syphilitic non-infectious in a very short time, we thus had the means in our hands of completely guarding against syphilitic infection if this treatment were properly used. It was found from an inquiry in different parts that doctors responsible for the treatment of syphilis had in many cases abandoned the classical methods and that the treatment of this disease was not always carried out efficiently. It was therefore proposed that leading syphilologists from the United States, Germany, France, England, and Denmark should be consulted on this subject. They unanimously agreed with enthusiasm that an international study should be made to determine the best methods of treatment, emphasizing that the doctors of the whole world should have substantial proof of the best way of carrying out the treatment. Excellent material was then collected in the form of complete records of over twenty-five thousand cases of syphilis treated in selected clinics of the above mentioned countries. After completing the considerable work involved in studying this material, the Commission of Experts in October, 1935, was able to present definite proposals for the best methods of treatment, proposals based on the exhaustive study of this large amount of material from these five countries. Such a documentation could obviously only have been procured by an inquiry undertaken by the Health Organization.

The Salvaisan preparations themselves have been the object of international standardization, as our Commission on Standards has laid down rules for the proper testing of these important drugs. Thus the Health Committee's program as regards syphilis was rounded out by a general survey of the disease, covering its diagnosis and treatment.

### *Rabies*

Among the many institutions throughout the world dealing with the prevention of hydrophobia, there is still no agreement about the best way of preparing rabies cords for inoculation. In 1927 the Health Organization began an investigation into the results obtained by the various methods to compare their prophylactic efficacy, the frequency of accidents due to their application, their cost and the possibility of giving treatment in places some distance from anti-rabies centers. Some hundred institutes replied to the questionnaire of the Health Organization.

An International Conference was held at the Pasteur Institute at Paris in 1927, at which sixty representatives of Government and anti-rabies institutes were present. A special commission discussed the nature of rabies virus, important contributions having recently been made to existing knowledge on the subject. Another commission dealt with public health regulations and orders for international veterinary quarantine and recommended modifications corresponding to the present stage of scientific knowledge.

The report of the Conference, which contains a critical analysis of the information received and the conclusions reached, is a unique record of all that is so far known about rabies.

One of the results of this Conference was that the majority of the anti-rabies institutes have adopted a uniform method of compiling their statistics which aids in the comparison of results.

The Health Organization publishes annually an analysis of the annual statistics of anti-rabies institutions in its

Quarterly Bulletin, where most of its Scientific Publications are to be found

### *Leishmaniasis*

More recently the Health Organization instituted an inquiry into Leishmaniasis the presence of which in the Mediterranean countries has aroused a great deal of interest, and the inquiry already made has proved that this disease is much more common than had been appreciated

### *Leprosy*

The Health Organization has a Commission on Leprosy which has published detailed reports on the treatment and prevention of this disease. An international center for research in leprosy placed at the disposal of the League by the Brazilian Government was inaugurated at Rio de Janeiro in April, 1934

### *Rural Hygiene*

As a result of an important European Conference on Rural Hygiene, a series of problems was raised. I may just mention the question of flies, as this could not be omitted from a discussion of the problem of rural hygiene. It was evident that despite considerable work in this field, our information concerning the prevention of flies was not sufficiently exhaustive, and it was therefore left in the hands of certain competent entomologists. A compatriot of mine, Professor Mathias Thomsen, has made an interesting study of the habits of the house fly and has submitted practical proposals for combating it which have given very good results in my own country. An interesting film has been made by him on this question. As the fly problem obviously varies in different countries, a Conference of Entomologists met a year ago in London and is now undertaking a study of the house fly in different parts of Europe.

### *Typhoid Fever*

In the case of typhoid fever the diagnosis is of course very important, one of the main tests being the Widal



reaction This is carried out in such a variety of ways in different laboratories and the results are indicated in such a different manner that it is not possible to compare what is, for instance, a Widal test 1 100 in one country with the corresponding indication in another For this reason comparative tests have been performed in a series of countries and a proposal has been made by which it is hoped to obtain more uniform results My remarks concerning the serological test of the typhoid bacillus also apply to *B abortus* Bang and other microbes

### *The Salmonella Group*

We know that the whole Salmonella group is becoming more and more complicated and that differentiation can only be performed with well known strains of these bacteria and well defined corresponding sera As this question is of great epidemiological importance, the Health Organization is considering the creation of international centers for this purpose

### *Physical Education*

Another problem of great current importance is that of physical education This question has aroused considerable interest, which I am sorry to say is due to a certain extent to its military significance The heavy physical strain now laid on the younger generation is the concern of many Health Administrations

A rapidly growing interest in athletic sports and games was apparent all over the world even before the great war, and in many countries support was given to such activities out of public funds, perhaps because it was hoped to obtain better human material for military service, or, more generally, because athletics were believed to improve the health of the people Since the war, enthusiasm for athletics has grown to an extraordinary degree The man who runs 100 meters in x seconds or throws a discus y meters is revered as a national hero One consequence of this popular interest is that the sums spent upon athletics and sports have grown enormously Public opinion de-

mands that clubs and organizations concerned shall be supported out of public funds. Very few people or authorities, indeed, venture to raise the question whether the money voted for athletics is well spent or the contrary. The Health Organization of the League of Nations, aware of the importance of the issues this problem involved, appointed a number of experts who met in Copenhagen in January 1931. These included several physiologists who had contributed to the study of muscular work (Durig, Liljestrand, Lindhard, Loewy). The conference agreed to ask the Health Organization to initiate and supervise a study of problems connected with the physiology of athletics and maximal muscular work.

Shortly after the Copenhagen meeting, a unique opportunity presented itself to carry out studies of the heaviest type of work. Three young men, who were trained athletes and at the same time well versed in the experimental work in question, consented to work in the laboratories of Zoo physiology and of the Theory of Gymnastics in Copenhagen University, for two years as experimenters and as subjects, thereby ensuring an amount of cooperation which could scarcely have been attained in any other way.

The Commission then studied the Heat Regulation, the Respiratory Metabolism, the Influence of Diet on the Capacity for Work, the Blood Sugar during Work, the Lactic Acid in the Blood, the Respiration, the Oxygen Supply in Work of Maximum Intensity, Kidney Function and Muscular Work, Training and Fatigue.

The importance of these studies may be considered not only from the scientific results of the work, but also from the point of view that they afforded an excellent example of how research of this nature should be carried out in a purely scientific manner in order to obtain results of real value. Accordingly, the latest technical committee of the Health Organization on Physical Fitness is composed of physiologists specializing in this matter. From the United States we hope for the collaboration of Professor Dill of Harvard.

*Work of the Malaria Commission*

The appointment of this Commission was due to the fact that, in consequence of the Great War, the epidemiological situation had become more serious, this deterioration taking the form of a recrudescence of malaria in the countries where that disease prevails. The Commission's function was to deal with the difficult problems with which the health administrations of those countries were confronted.

The causes of that recrudescence are well known: the disorganization of services, the suspension of anti-malarial measures, the economic and social upheavals due to the War, the overpopulation of certain areas in every continent under the worst possible housing conditions, and, in certain countries, migrations of sections of the population, malarial or otherwise, owing to famine. All these are factors which favor the outbreak of epidemics.

In view of the speed with which malaria resumed possession of countries where it had been entirely or nearly extinct, some doubt arose as to the value of the methods formerly employed against it. For many countries malaria was becoming a burning medical and social question which was too large for the national technical and financial resources and offered an excellent opportunity for international cooperation.

The Commission was composed of authoritative experts from various countries, and its function was to organize a complete program of work and international cooperation, taking principally the following forms:

Collection of epidemiological data as to the distribution and character of malaria, examination and selection of such information, and study of the results obtained by the various methods employed in anti-malarial work.

These investigations were conducted on the spot in most of the malarial countries, with the assistance of the Commission's members and experts. At the request of certain countries where malaria is severely endemic, the Commission's experts undertook epidemiological inquiries and

drew up programs of anti-malarial work adapted to local conditions

The first report issued (C H 273) contained an exhaustive study of epidemiological factors in the malarial countries of Europe, and called attention to the urgent necessity of a campaign against malaria

The Commission's second report (C H Malaria 73), dealing with the "principles and methods of anti-malarial measures" in the malarial countries of Europe, made use of the results of the investigations and inquiries carried out by members of the Commission with the cooperation of the health authorities and malarialogists responsible for anti-malarial work, and laid down the principles adapted to European countries

At the same time the Commission drew up, for the guidance of young malarialogists an extensive program of research, the results of which were to serve as a basis for elaborating and improving anti-malarial methods in the field. Most of the malarial countries thus had the benefit of a wide consultation and of the experience of malarialogists and other scientists in different countries

The discussions and exchanges of views between the experts at the annual meetings of the Health Committee and the meetings of experts dealing with specific malarial questions represented effective international cooperation in the investigation of local problems and the choice of the best methods of conducting anti-malaria work

The problem of treatment and the under consumption of quinine, as well as new developments in chemotherapy, were matters of such concern to the malarial countries that they necessarily formed the subject of investigations and comparative research conducted under the auspices of the Malaria Commission

At the same time, an inquiry carried out by the Secretariat of the Commission with the assistance of ninety-three health administrations revealed the prevalence of malaria, the approximate number of cases treated, the quantity of quinine required, and the possibilities of using it and apply-

ing treatment in relation to the anti-malarial organization of each country

The report C H Malaria 185, which summarized the results of this far-reaching inquiry, contained at the same time the fullest data as to the world prevalence of malaria and the small number of cases treated. For instance, whereas sixty-eight malarial countries estimated the total quantity of quinine needed annually for the treatment of all their cases at 1,172 tons, and the Commission's Secretariat estimated it at 1,387 tons, the actual consumption of quinine in the whole world was only 600 tons.

The inquiry into requirements of quinine was only one part of the program of investigation in regard to treatment which the Commission had begun in 1924 by inquiring into the therapeutic value of the total alkaloids of cinchona. The researches were conducted with the cooperation of several malarial countries, and led to the establishment of a standard formula for a mixture of alkaloids entitled, "Totaquina", whose efficiency is about equal to that of quinine.

In view of the progress of chemotherapy and the possibilities opened up by the extensive experimental material collected for purposes of treatment, the Commission decided that comparative research should be undertaken under its auspices into the efficacy of synthetic drugs in the treatment of attacks, the prevention of relapses, and prophylaxis.

These studies were carried out simultaneously in 1935 and 1936 in Algiers (Professor Sergent), in Italy (Professor Bastianelli), in the Federated Malay States (Professor Fletcher and his collaborators), in Roumania (Professor Ciuca) and in Russia (U S S R) (Professor Sergueff), the object being to compare the efficiency of quinine and the synthetic drugs, atabrine and plasmoquine.

These large field experiments comprised in all 11,858 persons and have undoubtedly shown the great efficiency of the synthetic drugs, both in the treatment and the

prophylaxis of malaria Compared with quinine by controls followed for over one year, we now possess a good estimate regarding the dosage, the indications, the administration and the efficiency of these drugs

The third general report on the therapeutics of malaria (Quarterly Bulletin of the Health Organization, Vol II, No 2), based on controlled laboratory research, determined the field in which these substances could be employed and fixed experimental bases for the methods of titrating anti-malarial products

The fourth report on treatment, which is now in preparation, will incorporate the results of the coordinated researches begun under the Commission's auspices in May, 1935

There have also been coordinated investigations or reports by experts on other problems such as malaria in deltas, housing in relation to malaria, and the biology and geographical distribution of *A. maculipennis*

The teaching of malariology was another important point on the Malaria Commission's program Since 1926, international courses in malariology have been organized under the Commission's auspices with the aid of the European school of malariology and anti-malaria institutions in various countries

During that period, eleven courses have been arranged in Europe and three at Singapore, with the cooperation of the health authorities and universities and the malariologists and experts in the different countries Over 200 young malariologists, coming from more than fifty malarial countries, have now had opportunities of gaining some experience by working in different countries under the guidance of highly qualified experts

Reference need only be made to the increasing number of international schools of malariology to prove once again the value of these international courses

An important activity of the Malaria Commission has been the organization of collective study tours of malari-

ologists from all parts of the world in different countries. During more than ten years this coordination, these intimate relations, these exchanges of views and field studies by malariologists of different schools have produced results, which also would have required a much longer time to accomplish without the intervention of the Health Organization.

To sum up, the Commission has succeeded in

Establishing methods of investigation, and so determining the extent and degree of gravity of malaria in the world

Organizing the training of malariologists, who have in turn organized the anti-malaria services in their respective countries,

Laying down methods and principles of treatment and, as far as possible, standardizing methods of work,

Setting on foot an extensive program of coordinated research with the collaboration of experts and health authorities in various malarial countries. These researches have already yielded valuable results in the practical field.

Finally, the Commission has always been at the disposal of malarial countries for purposes of investigation and to assist them in organizing their malarial services.

I should like to emphasize the most valuable assistance the malaria work of the Health Organization has received from American experts: Dr M. A. Barber, Dr John A. Ferrell, Dr L. L. Williams, Dr Hackett and others.

A particularly tragic chapter was the accident in Syria, causing the sudden death of Dr Samuel T. Darling. His memory is perpetuated in the Malaria Commission by the medal bearing his name which is awarded for outstanding work on malaria.

### *Biological Standardization\**

I now turn to another question which occupies the attention of the League: that of biological standardization.

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\* R. Gautier. The Health Organization and Biological Standardization. Quarterly Bulletin of the Health Organization of The League of Nations. Vol. IV.

By this term we mean the assay in relation to a single stable standard preparation of substances whose specific activity can only be estimated by comparative tests on laboratory animals

The activity of the standard preparation is not always appraised by biological methods, for certain vitamins and hormones, for instance, it has already been found possible to take the active substance in chemically pure form as the standard, and to define this by its physical and chemical characteristics. If titration relative to such a standard is still effected by biological means, the reason is that preparations issued for therapeutic use do not usually contain the active substance in its pure form and are frequently mixtures. So long as these conditions prevail, any method of assay other than the biological will accordingly be unpracticable. As soon, however, as the action of such preparations can be measured by physical or chemical processes, it is clear that the biological method must be discarded.

To have a standard preparation is not enough, its action must also be measurable and expressible in terms of a unit of activity, the latter being defined as an arbitrarily selected volume or weight of the standard preparation. Experience, war-time experience in particular, has shown the difficulties in which physicians, public health services and manufacturers alike are involved through the existence of a variety of different units expressing the potency of one and the same drug.

The physician, confronted with a number of preparations from various sources must choose. Being anxious to make his treatment effective, he will select the most potent. How is he to recognize it, however, if the drugs have all been titrated on a different basis? How can he compare the therapeutic results he achieves with those reported by a foreign colleague if there is no common measure for substances used on different sides of a frontier? Finally, an even more serious consideration, many deaths could have been averted if the sera used during the war had been assayed in relation to a single standard. Doctors would



not have been betrayed by the unitage given on foreign ampoules into injecting quantities of serum which they had good reason to regard as sufficient, but which were in fact inadequate, since the assay had been effected in terms of a unit of lesser potency than that to which they were accustomed

It is the duty of the public health departments responsible for the control of medical remedies to reject ruthlessly all preparations of inadequate therapeutic value, whether they be of local or of foreign origin. In this work, uniformity of titration will be of valuable assistance to them.

Manufacturers who do not supply the home market alone but intend to export have to take account of the conditions which each country lays down for the import of drugs. Now, if all countries adopted the same unit, matters would be greatly facilitated for the producing firms, who would be relieved of the trouble of adjusting their assays to the national units which subsist here and there.

The decision to have the question of biological standardization internationally studied was taken by the League of Nations Health Committee at its second session (Geneva, 1921). From that date onwards there have been held a series of conferences, which are listed below:

International Conference on the Standardization of Sera and Serological Tests, London, 1921

International Conference on the Standardization of Sera and Serological Tests, Paris, 1922

Technical Conference for the Study of Certain Methods of Biological Standardization, Edinburgh, 1923

Conference for the Standardization of Anti Dysentery Sera, Geneva, 1924

International Conference for the Biological Standardization of Certain Drugs, Geneva, 1925

Laboratory Conference on Blood Groups, Paris, 1930

Conference for the Standardization of Vitamins, London, 1931

Conference for the Standardization of Sex Hormones, London, 1932

Second Conference for the Standardization of Vitamins,  
London, 1934

Second Conference for the Standardization of Sex Hormones, London, 1935

In 1924, the Health Committee decided, in order to secure continuity of work, to set up a Permanent Commission on Biological Standardization, which has so far held six sessions (Paris, 1924, Geneva, 1926, Frankfurt, 1928, Geneva, 1930, London, 1931, Copenhagen, 1934) Up to 1934, it consisted only of six regular members and one associate member for the study of veterinary questions, but the Health Committee has now reorganized it on a wider basis

Dr McCoy, Director of the National Health Institute at Washington, has been a member of this Commission from its very beginning and I am very grateful for his most active and valuable collaboration Dr Voegtlin and Dr Fitzgerald have also actively assisted as members of the Commission, nor should I like to leave out the name of Dr Wadsworth, who has cooperated actively in the work of the Commission

The Commission's method of work is based entirely on international cooperation When the state of our knowledge concerning a given substance seems to warrant an attempt at standardization, the Commission entrusts the conduct of the preliminary work to a certain number of official and private laboratories having special experience of this branch of research, the experimental results being coordinated at the Copenhagen Institute in the case of serological questions and at the Hampstead Institute in other cases As soon as it appears from the whole of the material thus collected that the solution of the problem is at hand, the experimenters concerned are convened in conference, and any remaining divergences are then easily smoothed out The Commission thereupon makes recommendations, which are submitted to the Health Committee of the League of Nations for approval

It is accordingly the business of the Biological Standardization Commission first to establish standard preparations

and second to select units to express their potency. This done, there remains to secure the acceptance of such standards and units for international use. Two different situations must be considered. In the first, either one or several standards and units are already in use for the substance to be standardized. In this case, some caution is required in order to avoid coming into conflict with the official regulations and alienating the medical profession, which may be accustomed to prescribe a given serum in doses of, say, 500 units, or insulin titrated in rabbit units. Some compromise must be arrived at which will satisfy both these requirements and will consist either in adopting an intermediate value between the extremes of the units in use or in determining a ratio of potency as between the international standard and a national standard which some country may be anxious to keep. In the second, the field is clear, and the Commission is in a position to propose the standard preparation and unit which seem to it best suited for international requirements.

From the establishment of a standard and the selection of the unit to the adoption of a standard method of assay was but a step, nevertheless, in most cases the Commission refused, on principle, to take it, reasoning that methods are liable to modification and improvement according to the indications furnished by research and that it is therefore the standard which should be kept immutable while the method may vary. Moreover, to attempt to impose some particular method, which will never be perfectly accurate since it is based on biological processes, is to restrict research. Now it is important to leave full freedom to research workers who endeavor to improve existing methods of assay or devise new ones. This is why, whenever several methods may be used, the Commission has merely mentioned them, though it has specified which one appeared to have given the best results.

There is another principle already current in serology, though it has not yet been generally recognized in other branches, by which the Commission has been guided throughout—namely, that the potency of a preparation

must not be judged in relation to a given biological action, but compared with that of a specified weight of a standard preparation. Indeed, any attempt to define a unit through the reaction induced in the animal would merely tend to perpetuate certain ideas which it is desired to eliminate, such as that of the "physiological" unit or "clinical" unit, the effect of which is difficult to appraise and which are liable to vary, not only from one animal species to another, but even in one of the same species.

So far, although the Commission's recommendations have been put forward merely by way of indication, they have been followed by the large majority of laboratories, a result that may be ascribed to the high scientific standing of its members and of the numerous experts of many countries which it has been its privilege to associate with its work.

Considering the long list of substances for which international standards had been established under its auspices, it appeared desirable in 1935 that its recommendations should receive official sanction. A number of countries had, it is true, already introduced the standards and units proposed into the recent editions of their pharmacopoeiae, acting upon the recommendation of the Second International Conference for the Standardization of the Formulae of Heroic Drugs (Brussels, 1925).

It was important, however, that these recommendations should receive official sanction and that the standard and units advocated should be introduced in the pharmacopoeiae of the various countries. This was achieved by an Inter-governmental Conference, which met in Geneva, 1935, and was attended by representatives of 24 countries, including the United States. This conference expressed the hope that the use of the international standards adopted by the Permanent Commission on Biological Standardization of the Health Organization should be made effective by the competent authorities of all countries. Furthermore, that these international standards should be distributed free of charge.

All this work on vitamins, hormones and drugs has been carried out under the auspices of Sir Henry Dale, Director of the National Institute for Medical Research in Hampstead, London, from whose institute these standards are distributed to all the medical centers in the world. On the other hand, the work on sera and tuberculin has been concentrated in the Copenhagen State Serum Institute, and these standards are distributed from this center.

The international standard preparations held and distributed on behalf of the Health Organization of the League are as follows

A BY THE STATENS SERUM INSTITUTE, DEPARTMENT OF BIOLOGICAL STANDARDS, COPENHAGEN S

<i>Standard</i>	<i>When adopted</i>	<i>International unit in milligrammes</i>
Diphtheria antitoxin	1922	0.0628
Tetanus antitoxin	1928	0.1547
Anti-dysentery serum (Shiga)	1928	0.0500
Gas-gangrene antitoxin ( <i>B. perfringens</i> )	1931	0.2660
Gas-gangrene antitoxin ( <i>Vibrio septique</i> )	1934	0.2377
Gas-gangrene antitoxin ( <i>B. oedematiens</i> )	1934	0.2681
Gas-gangrene antitoxin ( <i>B. histolyticus</i> )	1935	0.3575
Anti-pneumococcus serum, Type I	1934	0.0886
Felton anti-pneumococcus serum, Type II	1934	0.0894
Staphylococcus antitoxin	1934	0.5000
Diphtheria antitoxin for the flocculation test	1935	
Old tuberculin	1931	

B BY THE NATIONAL INSTITUTE FOR MEDICAL RESEARCH, DEPARTMENT OF BIOLOGICAL STANDARDS, HAMPSTEAD, LONDON, N W 3

<i>Standard</i>	<i>Nature of the Standard Preparation</i>	<i>When adopted</i>	<i>International unit in milligrammes</i>
Insulin—Dry insulin hydrochloride		1925	0.125
Insulin—Dry insulin hydrochloride, pure		1935	0.045
Digitalis—Dry powdered leaves of <i>Digitalis purpurea</i>		1926	100.0
Sulpharsphenamine—Dry sample of sulpharsphenamine		1926	—

<i>Standard</i>	<i>Nature of the Standard Preparation</i>	<i>When adopted</i>	<i>International unit in milligrammes</i>
Pituitary (posterior lobe)—Dry powdered acetone-extracted posterior lobes of ox pituitaries		1927	0.5
Strophanthus	Pure crystalline ouabain	1928	—
Vitamin A—Carotene		1931	0.001
Vitamin A—Pure carotene		1934	0.0006
Vitamin B—Standard absorption product of vitamin B		1931	10.0
Vitamin C—Pure l-ascorbic acid		1934	0.05
Vitamin D—Standard solution of irradiated ergosterol		1931	1.0
Vitamin D—Calciferol		1934	0.000025
OEstrus-producing hormones — Hydroxy-ketonic form		1932	0.0001
OEstrus-producing hormones — Benzoate of the dihydroxy form		1935	0.0001
Male hormone—Pure crystalline androsterone		1935	1.0
Corpus luteum hormone—Pure crystalline progesterone		1935	0.1

This standardization work has the advantage that the clinician who uses a serum, can always be certain of its content of active substance. Furthermore, experience has shown that the fact that the producer is obliged to indicate the number of units on the label of the ampoules, has made it necessary for him to increase the strength of his product, whereas previously he could put on the market bad preparations as well as good ones. Thus many sera have effectively improved and increased in strength after the introduction of these international standards.

This coordinated work between institutes in different parts of the world has taught us many new facts about the toxins and sera examined. When for a number of years there has been found in an institute fairly good concordance in the titrations of, for example, tetanus antitoxin, the workers of this institute might be induced to draw the conclusion that this titration was a simple matter. But experiments in different institutes, even with the same test sera and the same test toxins have shown divergencies which could only be referred to qualitative differences in the sera and in the toxins, for example, different avidity, or pH.

Thus this team work has increased our knowledge very considerably and has stimulated progress not only in the knowledge of the bodies in question but also in the principles of biological assay which more and more is tending to become a special branch of serology and bacteriology. These comparative studies have also increasingly demonstrated the necessity of selected, even standardized, animal material for quantitative studies.

### *Nutrition*

For the past twelve years the Health Organization has had under consideration the question of the best possible nutrition of the greatest possible number. These efforts were stimulated considerably by the 1935 assembly of the League of Nations, when the first delegate of Australia submitted a proposal which he described as "marrying agriculture and health." "Agriculture is in a bad way, the claim of health remains unsatisfied. Marry them, and you save the one and strengthen the other."

These questions have been taken up on broad lines by the International Labor Office, the International Institute of Agriculture, and the Health Organization of the League. I cannot enter into the details of this important work. Several commissions have been created, one technical under the chairmanship of Professor Mellanby with the very efficient collaboration of Professor E. V. McCollom of Baltimore and as members from the United States, Dr. Mary Schwartz Rose, Columbia University and Dr. Sebrell, National Institute of Hygiene, Washington. This Commission has already prepared reports setting out the energy, protein and fat requirements, the mineral and vitamin requirements, and problems recommended for further study. A list of these will probably give an idea of the scope of the present activities.

- (a) Assessment of the nutritional state of children
- (b) Nutritive food requirements during the first year of life

- (c) Minimum vitamin and mineral requirements
- (d) Minimum fat requirements
- (e) The nutritive and supplementary values of the different protein containing foods, to determine to what extent and in what forms animal protein is necessary for growth and health
- (f) The relative nutritive value of different cereals according to the degree of milling
- (g) The extent to which the increasing consumption of sugar is detrimental to health
- (h) Influence of climate on food requirements
- (i) The extent to which diets in common use fall below the standards recommended in the report
- (j) The optimum amounts of milk required at different ages

In June, 1936 the Commission also suggested a series of studies on milk, namely, in regard to the supplementary nutritional effects produced by the interaction of the dietary elements contained in milk on the one hand with those of cereals and potatoes on the other. Three types of research were suggested for this purpose, as follows

- (a) Metabolism laboratory observations on experimental animals
- (b) Institutional observations on the health, growth and development of children of all ages
- (c) Observations made upon large groups of children, for instance in elementary schools similar to those carried out in the United Kingdom and in the United States
- (d) Observations similar to those under (c) upon groups of pregnant and lactating women \*

Finally, a small group of experts, after a joint study in Great Britain, Sweden, Denmark, the Netherlands and Switzerland, are preparing a report on the nutritional,

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\* Quarterly Bulletin of the Health Organization No 3, Vol V, p 422



hygienic, economic, social and general aspects of the milk problem

These few indications will, I hope, give you an idea of the importance of the scientific work, connected with the nutrition work of the Health Organization

Time has only allowed me to mention some of the items upon which active research work has been necessary to solve the problems confronting the Health Organization. Thus, it has not been within the scope of this paper to mention the work on housing, with the very efficient collaboration of Professor Winslow, nor to speak of the efforts made in the sanitary reorganization of countries such as Greece, and China

Even friends of the League of Nations must admit that in the field of international political relations there have been some failures, and that confidence in the international agencies for the promotion of world peace has suffered some crude shocks

But I feel justified in claiming that in the international collaboration in health work, the last sixteen years show real progress, for instance the protection against the great pestilential diseases, such as plague, cholera, yellow fever, smallpox, and typhus fever. Our position is much stronger than ever before, thanks to the cooperation between the Health Organization of the League of Nations in Geneva, with its Singapore Bureau, in close cooperation with the Office International d'Hygiène Publique in Paris, with the Pan-American Sanitary Bureau, and furthermore I should not fail to mention the Maritime and Sanitary Quarantine Board of Alexandria and finally the Austral-Pacific Bureau. The mere existence of all these organizations shows that the network of international relations is becoming thicker, stronger and better organized

I should also like to point out the importance of the personal relations established by the collaboration of experts from different countries when they meet in the different commissions. It is very gratifying to notice how

willingly outstanding men of science have devoted their time and knowledge to the technical work of the Health Organization

Let me give you a very recent example During the present unhappy conditions in Spain, there is reason to fear that *typhus* fever may spread, and the question of vaccination against this disease has become urgent As opinions about the best methods of vaccination differ very considerably, particularly the question of dead vaccination contra living, a consultation on this matter was convened in Geneva In spite of the exceedingly short notice, all the leading experts responded to the Health Organization's invitation, among them Professor Hans Zinssei, of Haivaia This Commission had not finished its work when I left Geneva on September the 2nd, but I am sure that its report will be of service to Spain and to the world

I cannot end my paper without expressing how much the Health Organization, from the beginning of our existence, is indebted to the very great assistance we have had from your country, the United States of America The material help has facilitated ventures which could scarcely have been undertaken without this support, and a great number of your outstanding specialists have generously given their time and knowledge to this international collaboration This fact contributes very considerably to the optimism with which I look to the future of this international collaboration for the improvement of preventive medicine in the whole world



COUNT CAGLIOSTRO  
AN EXCURSION INTO EIGHTEENTH  
CENTURY CHARLATANISM\*

GEORGE H. LATHROPE

The word *charlatan* is taken direct from the French which in turn derives it from the Italian *ciarlatano*, substantive of the verb *ciarla*, meaning to prattle. A charlatan therefore is, in the original meaning, a prattler, while later is added the idea of one who boasts extravagantly, and finally we have this definition—"one who makes unwarranted or extravagant pretensions, as to the possession of knowledge or skill"\*\*. In this sense it has come to carry rather sinister or at least opprobrious implications to those of us who entertain pretensions to honesty. That such sinister meaning should always attend our employment of the term does not seem altogether fair, and in the sketchy portrayal of one of the world's great charlatans which I shall attempt this evening, I would ask you to withhold your more severe judgment, at any rate till the end.

In presenting this study alongside Doctor van Beuren's wholly delightful picture of Rabelais, I have no intention of suggesting that the two men, Rabelais and Cagliostro, are on anything like the same moral or intellectual level or that in any but an antithetic manner the one should suggest the other. Comparisons between them show some similarities, but greater contrasts. Cagliostro in his own field was as great a man as was Rabelais in his. Both possessed a rowdy humor. Both had a keen insight into the foibles of humanity and knew well how to play upon them. They contrast sharply, however, in their background, education and purpose in life. Rabelais, as Doctor van Beuren has pointed out, was of gentle birth, was trained by study of the humanities, knew the modern

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\* Read before a meeting of the Section of Historical and Cultural Medicine, January 13, 1937

\*\* Standard Dictionary

languages as well as the classics. He studied theology, law, and medicine in the best universities of the day, and above all was a man of letters whose writings have influenced and delighted mankind from his day to our own. Cagliostro was of low birth, educated in the gutter and the dark and murky university of the underworld life of his time. Charlatan to the core, he was a mere pretender at linguistics, wrote nothing, because he could not write, left to posterity a reputation and record solely of trickery and deceit. The one satirized the weaknesses of humanity to its instruction and betterment, the other capitalized those weaknesses for his own selfish ends.

With other ideals in life, and with an education comparable to that which Rabelais enjoyed, Cagliostro might have rivalled Paracelsus. He was equally quick-witted and keen, equally noisy in discussion, fully as bombastic and overbearing. He might in some degree be likened to Falstaff. The gross makeup and gross appetites of the two were much alike, but comparison turns in favor of Sir John, for his roguery was of the childlike type, one might almost call it honest. Certainly it was not vicious or harmful. He cheated and robbed for the fun of the thing, and with a bawdy glee that makes him lovable, a quality claimed for Cagliostro by none of his biographers except his apologist, Trowbridge. One can only regret that our Count did not have some training in letters and leave us an authentic memoir or at the least some contemporary to play Boswell to his Johnson. Such a document might easily have gone down as one of the great biographies of all time. Certainly the raw material was there.

So much by way of preface

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Gilbert "Monsieur, I am anxious to be a physician."

Rousseau "A noble profession in which you may choose between real science, ever modest and self effacing, and quackery, ever noisy and empty. If you would become a physician, young man, study if a quack, nothing but impudence and effrontery are necessary."

*Memoirs of a Physician—Dumas*

As the healing art is the offspring of religion and intellectual curiosity, so is charlatanism the illegitimate child of religion and greed. Both medicine and quackery are so ancient and full grown when we first know them that no one may say which is the elder. Records of the one are as ancient as accounts of the other and time out of mind the bastard brother has fattened and waxed rich on the energy of the honest scientist whose discoveries he has emasculated and corrupted to his own gross misuse.

Yet there is always some offset and the record of quackery is not wholly black, or shall we say that medicine has from time to time had its eyes opened through the medium of charlatanism and thus seen great lights. Did not Hahnemann, more than any other, give impetus to a really scientific study of the *materia medica* and a more rational therapeutics? Did not Mother Eddy direct attention to our flagging interest in, and almost criminal negligence of, the neuropsychiatric field? What of osteopathy as a stimulus to modern orthopedics and physiotherapy? Has not Freud done a distinct service in prodding some, and all too few as yet, of our psychologists into seeking to place themselves on a firm basis of scientific knowledge?

The harm of quackery is infinite, but withal it carries grim humor and caustic mirth in its train. Tongue in cheek, it fleeces its victims and appeals for security in the very sense of ridicule which is heaped on its dupes—some innocent, others designing as itself.

The man around whom this particular discussion is developed may be regarded as pure quack, a scion of rascal dom, the Great Liar in "a World of the merest incoherent Lies and Delirium," as Carlisle in his own atrabilious way regards him. Or there is the alternative picture which Dumas portrays and which Trowbridge, of modern writers, seems to feel is more accurate, namely, that of a man who befriended the poor and who schemed with high purpose the overthrow of tyranny but who did not scorn to employ

what to modern eyes appear low and ignoble means, even rank deceit, if thereby he gain high ends No doubt there is need for interpretation

A glance at the times will perhaps illuminate his background and his stock in trade His milieu was that of the French Revolution Born in 1743, he died in 1795 at the age of fifty-two His period of greatest activity or influence or notoriety, as you will, was the fifteen years from 1770 to 1785 The Seven Years' War between Frederick the Great and the allied nations had come to an end in 1763 The French and Indian Wars had stripped France of her American Colonies and the campaign in India had ended her colonial state in the Far East The American struggle for freedom followed Poland was being partitioned by Frederick and Maria Theresa of Austria England, under the George II and III, was warily eyeing the confused political situation in Europe, ready to pounce if it might be to her advantage, apprehensive always lest the seething popular discontent of the continent should wash up on her own shores and infect her body politic Underneath all, revolution was brewing in France Louis XV, the "Well Beloved", with his series of mistresses from Pompadour to the du Barry, his unsuccessful colonial wars and his expensive victories on the continent, had impoverished, overtaxed, and alienated his subjects Poverty and discontent filled France Hunger stalked naked through its streets and lanes Injustice and wrong doing were the order of the day Mere existence was problematic One existed as one could The middle class was being slowly crushed out of existence between the despairing and desperate lower orders and the selfishness and self deceiving extravagance of the aristocracy, who, adopting the motto, "eat, drink, and be merry", sought to hide from their fears of tomorrow in the license of today Carlisle well terms it "a World of the merest incoherent Lies and Delirium" Small wonder that charlatanism was rife Everyone had a cure to offer Anyone's guess was as good as another's The church was in exile Ancient verities

had gone by the board. The magic words "Liberty, Equality, Fraternity", were rapidly replacing the old religion and Voltairne, with his religious and intellectual quackery was leading the dance. It was a veritable Walpurgisnacht. Naturally in such a maelstrom of political, economic, and intellectual confusion mountebanks and charlatans, soothsayers and wonderworkers became the order of the day. Sanity and rational thought were at low ebb. Men like the Comte de Saint Germain, Mesmer, Psalmanazar, and Casanova flourished. The wonder working tomb of the Abbe Francois de Paris became a Mecca for pilgrimage. Ghosts stalked through the night and portents filled the air.

Into these troublous times in 1743 there was born to one Pietro Balsamo, a shopkeeper of Palermo, a son destined to give color to a mean and squalid era, to lend some humor to tragedy, to be, as LeNotre describes him, "a precious person, whose mysterious figure dominated the last hours of the French monarchy." Giuseppe Balsamo was soon left fatherless, and the boy, endowed with insatiable greed for food and very little in his mother's lean panty to satisfy it, developed to the full his propensity to lie, cheat, and steal. He soon became the terror of all the housewives. An uncle, stepping in to save the family name, placed him in school. Escapades and floggings followed with such frequency that there was probably little time for polite learning. Whether voluntarily or no, history does not say, Giuseppe retired from school after no long trial of its benefits and then, penitently it may be, expressed a desire for a monastic career. Through the offices of the same uncle he entered as a novice at the age of 13 the Convent of the Benfratelli at Cartegnone. Here he was put to work in the dispensary and became famulus to the convent apothecary. *Sic volvere Parcas*. To his mind, already stocked with the wiles and trickeries of the street gamins and gutter urchins of Palermo, was now added in the convent laboratory the tincture of pseudo-science which was to loom large in his future career. Such knowledge of drugs and the care of minor wounds and ailments as could be acquired in this

place, he no doubt absorbed in his year or two of apprenticeship, but more, we may be sure, of the seeds of alchemy, thaumaturgy, and the crookeder precepts of the so called sciences of the day were implanted in the fertile soil of his mentality. Yet work, as ever, pulled on him, and Giuseppe grew particularly restless under the strain of one of his duties, which was to read aloud from the lives of the martyrs while the brethren were having their evening meal. A rather torrid humor came to his aid here, for one night as he read, he substituted for the names of the saints, the names of some of the brethren present coupled with those of Palermo's well known women of loose morals. This broke up the supper, brought him a flogging, and resulted in his fleeing the Convent that night and returning to his mother's fireside, convinced that the ecclesiastical life held no further attractions for him.

The quaint habit called eating was still his main hobby, but eating meant work, and in his nature these two were antithetic. To lie and steal were easier but uncomfortably, every now and then one was caught. So he took up painting, which was dull and of little profit and boredom drove him to search for other and more congenial pursuits. He promoted an affair between his cousin and her lover, appropriating to himself the latter's gifts. He forged tickets to the theatres and for the benefit of a certain religious house, falsified a will. Even in this early day he adopted the cause of the poor and defended them against the minions of the law, his own brazen impudence or the intercession of relatives gaining his acquittal when he was haled into court.

The last act of Balsamo's boyhood follows. One Marano, a goldsmith of Palermo, was much given to superstition and magic, and Giuseppe began by playing upon his fears and credulity, then spoke guardedly of buried treasure and how to obtain it by virtue of his own powers of divination. The ground prepared, he agreed for 60 ounces of gold to find a hidden treasure for the eager dupe. On a dark night he led Marano to a lonely spot in the woods and after vari-



ous incantations, set the latter to digging, the 60 ounces of gold having been deposited in a safe place nearby. While Marano sweated and dug, the youth exorcised the evil spirits of the place and did all he could to rouse the fears and apprehensions of his victim and to make his sweat a truly cold one. Suddenly some accomplices appeared in the guise of demons and other fearsome shapes, set upon the poor goldsmith and administered a terrific beating. In the ensuing confusion the 60 ounces of gold, the only treasure in the vicinity, of course disappeared. Conspirators and victim fled. Following his night of terror some sense was restored to Marano and soon after he made loud complaint. Giuseppe found it expedient to decamp from Palermo with all possible expedition.

Here ends all that is authentic of the boyhood career of the young Balsamo. At various times in later life he spoke of Malta, Egypt, Arabia, of companionship with the sage Althotas from whom he claimed to have learned all the mysteries of alchemy, and of adoption by the Sherif of Mecca, but whithersoever his travels in the next few years, we may feel sure that his education in trickery and deceit went on apace, however circumscribed or wide these perigrinations may have been. Like Pistol the world was his oyster.

After a lapse of several years Giuseppe turned up in Rome where he shortly married Lorenza Feliciani, the beautiful daughter of a girdle maker. Angering his father-in-law by his unwillingness to settle down to an honest but humdrum life of trade, he left with his wife and soon appeared on the northbound road in the regalia of a Prussian colonel. Meagre accounts of their vicissitudes in the years that follow are obtained from police records in Spain, Portugal, Belgium, southern France, and northern Italy. Their means of livelihood would seem from these records to have been the selling of love potions and beautifiers, telling of fortunes, and any other form of cheating that appeared to fill the needs of the moment. Different aliases were assumed as fortune varied, and in a prosperous period

Balsamo even had the effrontery to return to his native Palermo as the Marchese Pellegrini, probably with the idea of splurging before his boyhood acquaintances. But to his ingenuous disgust the past, incontinent, rose up to plague him. Marano, who still mourned his 60 ounces of gold, was not to be brazened out by titles, and the little matter of the forged will had meantime been uncovered. This resulted in landing Balsamo behind the bars. But he or Lorenza had made an influential friend in the person of the son of the reigning prince or duke, and this personage so intimidated the authorities that Giuseppe was let go. Once free, he and his precious spouse sought healthier climes.

Another period of historical obscurity follows, but in 1772 he turned up in London and took up house painting. This we assume to have been interior decorating. On the side he dealt in love potions, restorers of lost vitality (cantharides was well known to the initiate of those days), charms, beautifiers, and whatever else promised easy return for least labor.

He soon quarreled with others of shady reputation. As London was the Mecca for quackery it is probable that the sturdy English artisans of this particular guild had little use for a foreign interloper and, through recourse to the law, persuaded the Balsamos to leave. This they did, disappearing again in the dark mazes of the continent. No record exists of what followed till they reappeared in London in 1776 as the Count Cagliostro and the Countess Seraphina. On this visit the pair were apparently wealthy. At any rate their stock-in-trade had expanded, for now spirit rapping, hypnotism, legerdemain and occultism of all sorts, were added to their bag of tricks. Prophecy even was attempted but after three accurate predictions of winning lottery numbers, Cagliostro declined further effort in this field, either because his secret source of information failed him, or because he regarded the risk as too great. Yet it had helped to establish his reputation. He worked medical cures also but for the poor only and without charge.

This was a curious phase of the man's *modus operandi* which later became more conspicuous

Again, as a few years earlier, his fellow craftsmen in the occult and predatory sciences could not abide his success, and, through the offices of members of the legal profession of their own moral ilk, haled him before the tribunal of the Old Bailey. While it appears that no charges were sustained, they made things so uncomfortable, and the Fleet Street prison appeared so real that Cagliostro and the Countess Seraphina again, after a couple of years residence, shook the dust of London from their feet and sought other fields of harvest on the Continent

During this second stay in London, however, an event highly important in the life of Cagliostro, took place. He and Lorenza joined the Freemasons. Now whether this step was taken primarily because the secrecy, mystery, blazonry and titles of Masonry appealed to him as a fertile field for exploitation, or because he had already secured the Cofton manuscript and the idea of Egyptian Masonry had begun to mature, is not of importance. The fact is that it was during this second stay in London that he joined the brotherhood and proceeded shortly after to organize the Egyptian Rite of Masonry. Upon the death of a certain George Cofton, Cagliostro obtained his manuscript which dealt fully with the subject of Egyptian masonry. No one else knew of this so that Cagliostro had a perfectly free territory in which to erect a "system" of his own. He embodied in it his pet ideas of physical regeneration and transmutation of metals. He himself became at once, and was thereafter to his death, known as the Grand Cophtha of the new order, while Lorenza, or the Countess Seraphina, was its High Priestess. The restoration of lost youth and the power to make gold were notions in those days of high living with a definitely popular appeal, and the order flourished. Lodges were organized wherever he went, and the initiation, dues, and other perquisites became a source of unending and well nigh fabulous wealth.

The Count and Countess can now be followed through Saxony, eastern Germany and Poland, establishing Grand Lodges of the new order wherever they went, living in ease, even luxury, and travelling with a splendid retinue. In 1780 they reached St Petersburg, where they established free clinics and lodges. Access to Catherine, however, was denied Cagliostro—an object which was apparently the chief reason for this trip. Through the wiles of the fair Seraphina he did succeed in gaining the influence of Potemkin, Catherine's then favorite, but at the moment when audience with the Empress seemed within his grasp, he was attacked by both the Prussian and Spanish ambassadors at the Court on the slight matter of the Prussian colonel's uniform, and certain pécadilloes which appeared to have made some impression on the police blotters of Spain.

The impression created by Cagliostro during this visit to St Petersburg is set forth by Catherine the Great in a letter to Baron Grimm. Its strictures must be taken with a grain of salt for Catherine was never one to give herself away, and it is certainly a fact that in her literary efforts she wrote two dramas based on the Count's career. "I have read the memoir of Cagliostro which you have sent me and if I had not been already persuaded that he was a French charlatan his memoir would have convinced me. He is a rogue and blackguard and he ought to be hanged. M. Cagliostro arrived here at a very favorable moment for him, at a time when many lodges of Freemasons, infatuated with the principles of Swedenborg, desired with all their power to see spirits. They therefore ran to Cagliostro who said that he was in possession of all the secrets of Doctor Falk, intimate friend of Duke Richelieu, who had once sacrificed to him in the very midst of Vienna a black goat."

M. Cagliostro then produced his marvelous secrets of healing. He pretended to draw quick-silver from a gouty foot and was caught in the act of pouring a teaspoonful of mercury into the water into which he was going to put the gouty member. Later on, racked by debts, he took refuge in the cellar of Monsieur Yelagin where

he drank all the wine, champagne, and English beer that he could get. Monsieur Yelagin, annoyed by his brother rat in the cellar and by the thought of all the wine, and beer, gave him an old invalide to accompany him as far as Milan. This is the history of Cagliostro in which there is nothing exceptionally marvelous. I have never seen him near or far,—nor have I had any temptation to do so, for I do not love charlatans. I assure you that Roger son thinks of Cagliostro as much or less than Noah's Ark. Prince Orlov, contrary to his custom, has not made much of Cagliostro. He makes fun of him as of those who from mere curiosity run to see him, and he has contributed but little to change into wine the water of the shameless partisans of this poor devil. But since the more stupid and ignorant the charlatans are, the more impression they create in the great cities, it is to be supposed that Cagliostro will be in his element in Paris."

So on to Courland, then Warsaw, where a trifling slip in the process of changing lead into gold before a distinguished audience led to denunciation by one of the witnesses, consequent discomfort, and pressing need for change of climate. They travelled in style, according to his Inquisition biographer, "with a considerable suite, couriers, lackeys, bodyguards, servants and domestics of all sorts, sumptuously dressed, gave an air of reality to the high birth he vaunted." By now, be it noted, he referred mysteriously to his high birth in Trebizond, where a princess, compromised through a love affair with a prince of the Island of Malta, had revealed him to the world somewhat after the manner of Moses' discovery by Pharaoh's daughter.

In 1783 he arrived at Strasbourg more flourishing than ever. In these intervening years he had come in contact with the Illuminés, an inner order of masonry whose chief concern was the overthrow of the Pope and crowned heads in general, beginning with the French monarch in particular. It seems quite probable that he became an important and well paid agent for this revolutionary organization.

and endeavoured through it to strengthen his Egyptian lodges. Arrived in Strasbourg, whither his reputation as a healer and philanthropist had preceded him, he established free clinics and set about visiting the sick poor. He gave money freely where it was needed and refused all fees for his cures. He attached to himself here a licensed and well-trained physician who had run foul of his professional brethren and was for the time being outside the pale of good medical practice. The knowledge and skill of this man undoubtedly added greatly to the success of the clinic and enlarged the quota of cures.

He scorned clients of wealth, and when Cardinal de Rohan, Archbishop of Strasbourg, whose curiosity and cupidity were at once aroused, sent an invitation to Cagliostro to visit him, the latter replied to the messenger with consummate impudence,—“If Monseigneur the Cardinal is ill, let him come to me, I will cure him; if he is well, he has no need of me, I, none of him.” Thus did he bait his hook, for the Cardinal seems to have been the fish he was after in this particular pond. In due course he netted and landed him.

Cardinal de Rohan was the most prominent scion of the powerful de Rohan family of Brittany. He was high in the councils of the Church, and in 1778 and 1779 had been ambassador at the court of Vienna. He was very wealthy, but extravagant and always in debt. Alchemy and the occult sciences had long attracted him and he had his own laboratory in his palace at Savergne where he dabbled after the secrets of rejuvenation, the Philosopher's Stone, and whatever other occult matters aroused his interest. He and the alchemist and occultist Cagliostro fitted like glove and hand and it was not long before a meeting was arranged when acquaintance, then friendship were established. Cagliostro took up quarters under the Cardinal's roof. Great lover that he was, the beautiful Seraphina probably played no small part in the enslavement of the prelate. Trowbridge will not admit that she was anything but honest and pure but Carlisle, as do most contemporary observers, takes a rather sinister view of her love affairs.

with Potemkin and the Cardinal and regards her as the willing tool in her husband's hands, the lure for his victims. Just what gain Cagliostro secured from his friendship with de Rohan is not clear. Thowbridge says there is no record of his having money from him. That is as may be. It is probable that, as an agent of the Illuminés, Cagliostro gained prestige and influence through the acquaintanceship and was paving the way for furtherance of their plans. He kept up his free clinics, working wonderful cures, and from time to time made trips to Bordeaux, Lyons, and other cities where he established Grand Lodges and otherwise forwarded the interests of Egyptian Masonry. This was his great game and while the Illuminés undoubtedly regarded him as their agent, he unquestionably planned to make them subservient to himself, the Grand Cophtha of the Egyptian Rite. From these two sources at any rate sprang a sufficient fountain of wealth to make him now entirely independent of petty gain, and completely free to promote his reputation through his charitable ministrations to the poor and afflicted.

Le Notie tells us that the Count Cagliostro made his debut in Paris in 1781, and describes the house which he occupied, at the corner of the Rue Saint-Claude and the Boulevard Beaumarchais. It was still standing there in the early years of the present century when Le Notie visited it. From the description this is undoubtedly the house in which Dumas lays so many of the scenes in his *Memoirs of a Physician*. Apparently the Count's arrival in Strasbourg followed his appearance in Paris and he probably spent the next five years in residence both in Strasbourg and Paris.

Le Notie gives this interesting description of the man: "He was a rather awkward man, badly dressed in blue taffetas gallooned all over, and his powdered hair was arranged in long, drooping curls in the most ridiculously curious manner. He wore *chine* stockings with gold clocks, and velvet shoes with buckles gemmed with precious stones. There was an excess of diamonds on his fingers, on his shirt

frills, and on his watch chains, on his head was a charlatan's hat ornamented with white feathers, and eight months out of the year he wore a large blue fox-skin cloak, in addition to a fur hood like a *carapousse*. When children caught sight of him in his three cornered fox skin hat, it was a question as to who would get away first.

"His features were regular, his skin rosy, and his teeth superb. I shall not describe his physiognomy, because he had twelve or fifteen at his disposal. Never had such eyes as his been seen before."

Beugnot, who dined with Count Cagliostro at Madame de la Motte's, gives in his Memoirs the following description. "I only looked at him by stealth, and did not yet know what to think of him. His face, his head-dress, the man's whole appearance awed me in spite of myself. I waited to hear him speak. He spoke a most awful gibberish of Italian and French, and made many quotations, which were supposed to have been in Arabic, but which he did not trouble to translate. He alone spoke, and had time to touch on twenty subjects, because he developed them only as far as suited his convenience. He was constantly asking if he were understood, whereupon the company all around bowed to assure him of it. Upon entering on a subject he seemed transported and assumed a lofty attitude as regards both voice and gesture. But suddenly he would descend to the level of ordinary mortals to address most tender compliments and comical pretty speeches to our hostess. This manoeuvre lasted the whole of the meal, and I learnt nothing from the hero except that he had spoken of the heavens, the stars, the great Arcanum, Memphis, Hierophant, transcendental chemistry, giants, and huge animals, of a town which is ten times larger than Paris, in the interior of Africa, where he has correspondents, of our ignorance of all these beautiful things which he has on the tips of his fingers, and that he had interlaced his discourse with comically inspired compliments to Madame de la Motte, whom he called his *biche*, his gazelle, his swan, and his dove—thus borrowing his appellations from what



was most lovable in the animal kingdom. At the close of the dinner he deigned to put several questions to me one after the other, to all of which I replied with a most respectful confession of ignorance. I have since heard from Madame de la Motte that he received the most favorable impression of my person and my knowledge."

This carries us down to the affair of the Diamond Necklace. Though he was probably entirely innocent of any complicity therein, this marked the turning point in this precious rogue's career. Despite the very minor role he played in the drama and though he was practically an innocent victim, the story must be related because, justly or unjustly, it covered him with an opprobrium and unpleasant notoriety from which he never recovered. As a direct result of it he fell into the clutches of the Inquisition and died in a Papal prison.

A few of the *dramatis personae* deserve special notice.

Jeanne de Jacques-Rémy, self styled Comtesse de la Motte de Valois, was the daughter of a drunken poacher, who, though now fallen on evil days, was without doubt a left-handed descendent of Henri II and therefore entitled, the *bai sinister* being but a minor social impediment in those days, to the Valois name. Left an orphan in early childhood, as a street gamin of seven, she gained by her whining petitions the attention of the Marquise Boulaivilliers, who took Jeanne under her wing, reared her, gave her education and instruction in dressmaking, but turned her off on her runaway marriage to one Nicholas La Motte, a petty officer of dragoons. Madame La Motte Valois then became a reality and soon her spouse assumed the title of "Count." Thereafter she was the Comtesse de la Motte de Valois. During an effort to reconcile herself with her former patroness she met the Cardinal Louis de Rohan and by dint of her not inconsiderable sex appeal combined with an easy virtue, her complaisant spouse soon gained a captaincy of dragoons and the pair established themselves in Paris. Efforts to gain access to the court were unavailing but in various ways in which gambling and pro

curing probably played no small part, they maintained a position at least showy

Enter now Louis de Rohan, Prince of Brittany, Cardinal Bishop of Strasbourg, Grand Almoner of France, Ambassador to the Court of Vienna and holder of a dozen other titles. In 1770, while in residence at Strasbourg, he had officially welcomed to France the sixteen year old Marie Antoinette on her journey to Versailles to marry the Dauphin. De Rohan fell in love with the beautiful Princess and from then on his great and consuming ambition was to be near her at Court and through her influence, attain to the Ministry of State. A few years later (1779) he became ambassador to the Viennese Court but there, alas, bitterly offended Maria Theresa who never forgave him and succeeded in imparting her hatred of the prelate to her daughter, Marie. So at Strasbourg he met his heart's desire, only later on to be baffled and sickened by the futility of its pursuit. Also at Strasbourg he met the arch conspirator, the *fons et origo* of the drama, the precious Comtesse Jeanne, and equally at Strasbourg, fateful bishopric, he fell into the toils of Count Cagliostro. Beautiful in person, but dumb, was the Cardinal—lover of good living, lover of display, lover of women, but disappointed in his great love and unconsolated by an assortment of mistresses, religious enough to be steeped in mysticism, ignorant to the point of being an easy prey for the charlatan and a gullible dupe for the scheming adventuress. His enforced remoteness from, and ignorance of events at Court, made him swallow with avidity the messages sent him by his protégé, Jeanne, who fed him with tales of all she was doing to reinstate him and gain him favor with the Queen. Soon this little liar begins to transmit purported word of mouth messages from the Queen and the Cardinal was thus made hungrily ready to swallow the bait whensoever it should be dangled near enough to his esurient lips.

Meantime two honest jewellers, the one from an Amsterdam ghetto, the other of like complexion from Saxony, had been preparing the property for the drama, namely, the

Diamond Necklace itself Boehmer and Bassenger had met in the course of their trade in jewels, formed a partnership and been appointed Jewellers to the Court of Louis XV The King was disposed to deny his then favorite little and under the acquisitive eye of the du Barry, they built a thriving business Boehmer conceived the idea of a piece of jewelry for the King's mistress which should surpass anything the world had ever seen, sure that His Majesty would not deny her A well nigh certain and honest penny might thus be turned The assembling of the stones for the necklace then began and after some three years with an expenditure of 800,000 francs, the task was completed and the necklace ready to be offered for sale at the modest price of 1,600,000 francs *Eheu fugaces!* that such best laid plans should untimely gang agley Louis XV, that scarlet old sinner, just when the fruits of their labor hung temptingly before their eyes, was inconsiderate enough to contract smallpox, and in St Denis, uncomfortably, very uncomfortably for Monsieurs Boehmer and Bassenger, "fell asleep in the Lord", May, 1774 (Abbé Georgel)

Of course the du Barry was through and with her, their market Louis XVI was for a brief period attracted with the thought of presenting the necklace to the Queen, but Marie herself said France needed ships more than necklaces The months and years went by and no purchaser appeared Then a hint was dropped in the eager ear of Boehmer that the Cardinal Louis de Rohan might be interested in acquiring a dainty bit of jewelry for a High Personage This hint, needless to say, came from the fair Jeanne de la Motte de Valois, who meantime, by forged notes, had aroused the poor dupe of a Cardinal to a high pitch of expectancy She even went so far as to engineer a meeting between him and some replica of the Queen whom she had pulled out of a brothel in Paris The darkness of the shrubbery of the Trianon gardens, the necessity for little but whispered conversations, the gifts of a book and a rose from the supposed Queen, combined to completely befuddle the silly Prelate



talents revealed themselves That the dour and peevish Scot, Carlisle, should discover here a golden opportunity for venting his neurotic spleen in a biographic sketch of the type he gives in his *Miscellanes*, is no wonder, nor that an emotional writer like Trowbridge, with his evident leanings toward occultism and mysticism, should seek to apotheosize his hero

Carlisle writes the man down an unmitigated scoundrel and blackleg, unlettered, bombastic, and gross, Lorenza, his willing tool and able second Trowbridge goes to the other extreme, admits he was a schemer but credits him with high motive Somewhere between these two extreme estimates probably lies the true case One thing seems clear and to the credit of the Count and Countess However he used her, to whatever liaisons she leant herself in the course of their devious history, they stuck together through thick and thin, and it was only through the third degree methods of the Inquisition that her devotion to him finally gave way No one can greatly blame her for that and it is even possible that her confession was the factor that saved him from the death penalty which traffic with masonry entailed in the Inquisition courts

As to his practice of the Healing Art a few things are evident He had no degree, no medical education as it was known in those days, but during his apprenticeship to the apothecary of the Benfratelli he did have ample opportunity to acquire a knowledge of drugs and their use, and probably of minor surgery, and with this as a grounding he was in position to acquire far more real knowledge as the years went by He was certainly not lacking in intelligence and these opportunities could scarcely have been neglected, so that it is a safe assumption that his therapeutics were those in general use by the practitioners of the day Moreover, to this legitimate, let us say, therapeutic resource he added later on the subtle and shady practices of hypnotism and occultism, caring not *how* he worked his cures, only that he worked them As he went on, the conscious and successful effort to deceive must have

turned into a profound conviction of his own powers and thus his abilities in psychotherapeutics became greatly enhanced. Another fact of interest is that he took no money for his cures. He established clinics wherever he went, sought out the poor and treated them free,—even gave them food and money. To Trowbridge this evinces a true eleemosynary disposition and a love of his fellow men, but it may have sprung from design and good advertising sense. He was not after small game in those days. He sought a following in order to aggrandize his Egyptian Masonry which apparently paid him enormous dividends. What better method of securing the following he wanted for this semi religious, semi political order, than in imitating Jesus of Nazareth?

The age was one in which the old foundations were crumbling. Paracelsus had already made a bitter and devastating attack on the medical practice of the day and aside from the fact that Cagliostro did not belong in the regular ranks, his practice was probably no worse than that of the regulars and more successful in fact from his very deep conviction of his own psychic powers. Voltaire and Rousseau had undermined the spiritual and religious thought of the day. France, overlong under dominance of feudalism, was beginning to be shaken by the rumblings of the coming revolution and no one felt any security in former beliefs, religious, political, or philosophic. Loose thinking, loose living, unmorality and chicanery were rife and Cagliostro, the charlatan, was merely a sign of the times. That he moved in such high company in his later years was due to the fact that he had talents and organizing ability which were useful to one of the great revolutionary societies of the day. That, while serving them, he exploited the freemasons for his own ends was only to be expected from the character of the man and they probably were well enough aware of the risks run in employing him. He never betrayed them. Whether in the end they betrayed him is a question. They certainly did little to keep him out of the hands of the Inquisition. When all is told there is little

record of real harm done by him and no small record of good, whatever the motivation for its doing. Apart from the free clinics, he assuredly added a touch of humor, grim perhaps, but humor none the less, to an age otherwise drab and solid.

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## 1 SKIN HYPERESTHESIA IN ACUTE SALPINGITIS\*

JOHN S. LABATE

Fifty-three cases of acute salpingitis were examined for skin hyperesthesia. This was done by grasping the skin and subcutaneous tissues between the thumb and forefinger and then pulling straight out simultaneously exerting a vigorous twist.

Skin hyperesthesia occurred either over a wide area involving one or both lower quadrants or, as happened more frequently, over smaller areas involving only portions of the lower abdomen. Maximal areas of skin hyperesthesia can always be found. This may occur at the spino umbilical point (50 per cent) or at Ligat's point (12.7 per cent). Frequently (16.7 per cent) skin tenderness is found to diffuse downward from the spino umbilical point in the form of a band. The position of the spino umbilical point is described as an arbitrary point 2.5 cm lateral to the umbilicus on a line drawn from the anterior superior spine of the ilium to the umbilicus.

Skin hyperesthesia occurring over the above maximal areas is characteristic of acute salpingitis. The absence of skin hyperesthesia has no negative value. The presence or absence of skin hyperesthesia cannot be used to determine the severity of the infection. It may be quite fleeting in character or persistently absent in the face of the most severe infection of the tubes.

Of ten cases of mild subacute or chronic salpingitis 60 per cent showed positive skin hyperesthesia. All cases of tubo ovarian abscess failed to develop skin tenderness.

Ten cases of ectopic tubal gestation failed to show the presence of any skin hyperesthesia. The presence of skin tenderness favors the diagnosis of salpingitis.

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\* From the Obstetrical and Gynecological service of Bellevue Hospital.

## 2 OBSERVATIONS ON THE RELATIVE EFFICIENCY OF TWO TYPES OF ERGOT PREPARATIONS IN THE CONTROL OF POSTPARTUM BLEEDING

*From the Clinic of the*

MARGARET HAGUE MATERNITY HOSPITAL Jersey City

ROGER C. TER KUILE

Postpartum bleeding often is an alarming incident of the third stage of labor.

For its control oxytocic agents are used, of which the principal sources are the pituitary glands of animals, and ergot.



Ergot has heretofore been available in Galenical forms and as certain alkaloidal salts derived from it. Ergonovine is a relatively new alkaloidal derivative.

In order to rate its efficiency as compared to previously available alkaloidal derivatives, approximately five hundred clinic and private patients were studied relative to the time-response of the uterus to the two types of ergot derivative, together with the influence on this response of the type of delivery and of the anesthetic used.

As a result of this study the following conclusions were arrived at:

- 1 That ergonovine was more efficient in preventing and controlling abnormal bleeding than ergotamine tartrate
- 2 That ether anesthesia predisposes most to postpartum bleeding and nitrous oxide least, of the small group of anesthetic agents studied
- 3 That the type of delivery had no essential effect on the incidence of postpartum bleeding
- 4 That the occurrence of abnormal postpartum bleeding appears to predispose to sapremic infection of the uterus
- 5 That none of the corollary factors concerned in this study modifies the first conclusion as to the clinical superiority of ergonovine preparations over older forms of ergot derivatives

### 3 AN X-RAY STUDY OF GASTRIC FUNCTION DURING LABOR \*

A HIRSHEIMER, DERRICK JANUARY, AND JOSEPH DIVERSA

It is a common observation that vomiting occurs more often in obstetrical than in surgical anesthesia, and that frequently the vomitus consists of food that has been eaten many hours earlier. This is both disagreeable and hazardous, since aspiration of the vomitus has caused serious pulmonary complications.

No studies of gastric emptying during labor were found in the obstetrical literature.

Barium meals were given to ten primiparae in labor and roentgenograms taken at hourly intervals for three or four hours. The emptying time was three hours or less in all but two cases. In one there was definite delay at the third hour. Another patient, of whom it was not possible to get pictures after the first hour, vomited the entire test meal after delivery five hours later. There was no evidence of mechanical interference with evacuation in any of the cases.

Although the evidence is incomplete, the authors believe that there is a definite functional disturbance of gastric activity in some individuals during labor, and recommend great caution in the administration of food and oral fluids to all patients during labor.

\* From The Methodist Episcopal Hospital, Brooklyn, New York.

## 4 ELDERLY PRIMIPARAE

CLOYCE R TEW AND K KUDER

An analysis of 240 elderly primiparae, giving an incidence of 2.01 per cent in 11,919 deliveries during a four and one half year period at the Lying In Hospital, N Y City, showed the following significant conclusions

- 1 The oldest patient delivered was 46 years of age
- 2 The funnel pelvis was more frequently encountered than any other pelvic contracture
- 3 The occurrence of toxæmias in the elderly primiparae was 22.5 per cent as against 8.04 per cent in the clinic population
- 4 Tuberculosis showed a percentage three times as high as the controls group
- 5 Myomata uteri were twice as frequent as in the controls
- 6 Pyelitis of pregnancy was twice as frequent
- 7 That 22 per cent of elderly primiparae had undergone previous abdominal operations prior to pregnancy, some of which definitely influenced the course of the labor they exhibited
- 8 Persistent occiput posterior position and breech presentations occurred in 11.25 per cent and 4.1 per cent
- 9 That 53.3 per cent of elderly primiparae came to term with the head unengaged
- 10 Labor, in its entirety, and fractionally in different stages, was prolonged in elderly primiparae significantly
- 11 Cesarean section was performed in 12.9 per cent of the cases which figure is four times that of the control series
- 12 The incidence of forcep deliveries was twice that of the clinic population
- 13 The ratio of male to female infants born was 122:100
- 14 The incidence of post partum hemorrhage was greater in the group of elderly primiparae
- 15 Infantile mortality in the elderly primiparae was 10.74 per cent compared to 4.1 per cent in the clinic control
- 16 Maternal mortality was 1.25 per cent compared to the clinic control of 0.30 per cent
- 17 Puerperal infection and morbidity were notably higher than in the control series

5 THE SIGNIFICANCE OF CLOSTRIDIUM WELCHII  
IN THE GENITAL TRACT OF PREGNANT  
AND PUERPERAL WOMEN\*

STANLEY M BYSSHE

A routine series of 547 antepartum, intrapartum and postpartum women were studied, vaginal or cervical anaerobic cultures were taken

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## DEATH OF FELLOW

THORNLEY, JOSIAH PAYNE, 134 West 70 Street, New York City, born Tooresdale, Pa, July 17, 1867, died in New York City, July 21, 1937, graduated in medicine from the University of Virginia in 1887 and Columbia University, College of Physicians and Surgeons in 1896, elected a Fellow of the Academy April 6, 1922

Dr Thornley was a member of the American Medical Association, Consulting Dermatologist and Syphilologist to the U S Marine Hospital No 70, and Director of Dermatology and Syphilis at the Gouverneur Hospital

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## MODERN CONCEPTS OF ANEMIA FROM THE CLINICAL STANDPOINT\*

E B KRUMBHAR

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In the past two decades hematologists—whether in the laboratory or in practice, and especially in this country—have become increasingly aware of the benefits of studying the blood from functional, chemical and metabolic standpoints as well as from purely morphologic. The cell type period that started with the differential stains of Ehrlich and reached its climax in Europe with Pappenheim and Ferrata had finished its major contribution and was concerned with wearisome subdivisions of cell types that often proved to be either wrong or of minor significance. The opposing schools of the monophyletic and polyphyletic origin of the different blood cells have far from settled their differences and while it is of course desirable, yes even essential, that eventually the origin of each blood cell be definitely settled, yet we have become increasingly efficient in preventing this gap in our knowledge from holding up progress in other lines of hematologic research.

One such approach emphasizes the dynamic aspect of the peripheral blood and the blood-cell forming tissues as an exquisitely balanced, constantly active mechanism which demands, perhaps to our occasional sorrow, that we study the condition of the tissue as well as the blood

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\* The substance of a Friday afternoon lecture at The New York Academy of Medicine, February 26, 1937

itself in order to understand the present state of the system. How much has the study of blood diseases suffered from not having a convenient label such as "heart," or "kidney," or even "reticuloendothelial system" to indicate the unity of the two parts! The term "erythron" has been suggested as such a label for the red cell portion of the system but is not widely used in this country. Admitting that the bone marrow is a difficult tissue to study, still it would no longer be wise in this country to assert, as Turck was said to have done when asked about the bone marrow, "Sir, I am a peripheral hematologist!" No longer can we be content with the static information furnished by routine hospital request, for "reds, whites, hemoglobin, and differential," but if there is a disturbance in what I some years ago called the "hemolytopoietic equilibrium," the balance between the cell formation and destructive tendencies, we must seek evidence as to whether the disturbance is due to increased blood cell loss or destruction or decreased formation, and if the latter, whether the inefficient formation is due to lack of hemoglobin-building material, or of stroma-building material, or both, or of some regulatory substance that prevents either normal maturation of the cell in the factory, or expulsion of the fully formed cell into the circulation.

One of the developments of the dynamic viewpoint is the increasing use of sternal puncture, now a relatively trivial procedure under local anesthesia, which may once or even repeatedly give diagnostic and prognostic information about a given "blood" case that is not obtainable in any other way. There are now several good booklets and medical articles on this subject in English which will give you the information that I have not time to include here. Spreads from the puncture on slides may be made to identify cell types, or better, paraffin sections prepared which also show proportions and relations. Splenic puncture is another procedure that is routinely practised in certain parts of Europe, allegedly with profit to patient as well as doctor and without harm. It has not been tried enough in this country to warrant even a cautious recom-

mendation but it would not be surprising to see it also being used by us in another decade

What then do we need for a reasonable study of the peripheral blood of a given case of anemia? Erythrocyte and hemoglobin estimations and a stained spread remain most important, though the hemoglobin should be given in grams rather than in per cent of an unknown and arbitrarily fixed normal. Also repeated counts, not foolishly often, are important in establishing a prognostic curve, especially if normal levels have previously been recorded. From this material the color index can be estimated and measurements of erythrocyte diameters made, either directly by an ocular micrometer, or projected on a wall, to give a Price Jones curve or an average diameter—normal about 7.2-7.8 micra—obtained with an "Elio meter." This depends on the principle discovered a century ago by Young that a spectral ring will vary in size with the size of the round bodies that light is passed through. Of course evidence of regenerative ability is furnished by the number and type of nucleated reds and the amount of polychromatophilia. More accurate for the non nucleated young erythrocytes, however, is estimation in a vital stain, such as brilliant cresyl blue, of the per cent of the cell which, in 1922, I named the "reticulocyte" a name which was popularized by the use Minot made of it in determining regression in pernicious anemia. A simply determined hematocrit test under standard conditions gives the per cent of the collective volume of packed blood cells in a blood sample. The "Mean Corpuscular Volume" is determined by the number of total cubic micra in the hematocrit cells divided by the number of cells per cu mm, or the reading times ten over the number of million red blood cells. This is normally about 80 to 90 cubic micra, a more sensitive and more logical estimation of size than measurement of erythrocyte diameter. Various other calculations can be made to furnish volume indices, corpuscular hemoglobin content, and concentration, but are of less practical value.



As you all know, Minot and Murphy made the dramatic discovery in 1926 that pernicious anemia, hitherto a hopelessly incurable disease, could be regularly cured by liver extract, in the sense that proper treatment could not only check the disease but keep the patient in good health as long as treatment was continued. This not only was in itself a major medical discovery of the century which already has saved thousands of lives, but has also proved to be instrumental in changing our concepts of anemia in general. No longer do we airily divide cases into the "primary and secondary anemias," even though "primary" meant little more than "of unknown origin" and though "secondary" was practically regarded as a single disease group instead of the many groups which really were different in their nature and manifestations and required different remedial therapy.

To day we know a number of conditions causing a "macrocytic" form of anemia, a "microcytic," and a "normocytic," though we may be still groping for the common factor that produces the picture. This has not only completely disposed of the former German classification of pernicious anemia into idiopathic and secondary forms but has provided a most useful generalization for treatment, namely, that liver extract is apt to be the best treatment for all anemias associated with macrocytosis. In the same way we have come to associate an acquired microcytosis, especially if hypochromic, with nutritional deficiencies, and especially with a lack of available iron, so that sufficient iron therapy, in whatever form it may be given, is practically a specific for these types.

For an orderly consideration of anemias, we must have a classification, though to-day's best may easily be replaced by a better one to-morrow. As our knowledge is not yet sufficiently advanced to make a strictly etiological classification desirable, setting aside the "primary" and "secondary," it seems best to consider a pathogenetic classification something like that of Table 1.

TABLE I

## A CLASSIFICATION OF ANEMIAS

*I Mainly due to Disorders of Erythrocyte Formation*

- (a) Insufficient formation in bone marrow, usually normocytic (*aplastic, myelophthisic, due to physical injury, etc*)
- (b) Defective formation
  - 1 Erythroblastosis
  - 2 Spherocytic (*hemolytic jaundice*)
  - 3 Ovalocytic
  - 4 Sick cell anemia
  - 5 Poikilocytic, normochromic or hypochromic\* (*deficiency of diet, vitamin or hormone, hookworm, chlorosis, "idiopathic," etc*)
  - 6 Macrocytic\* (*pernicious, sprue, pellagra, secondary to some gastro-intestinal or liver disorders, etc*)

*II Mainly due to Blood Loss*

- (a) Hemorrhage from trauma (*acute blood loss*)
- (b) Chronic or intermittent bleeding, as in gastro-intestinal and genito-urinary tract
- (c) Abnormal blood vessels or other blood constituents (*purpura, hemophilia*)

*III Mainly due to Excessive Destruction*

- (a) Hemolytic infections, toxins, poisons, etc
- (b) Secondary to defective formation (*see Ib*)
- (c) Unknown nature (*Lederer's*) (*Banti's*)

It is obvious that some clinical pictures cannot be fitted exactly into such a category and that some, such as hemolytic jaundice, could as well be put in the class of excessive blood destruction as defective formation, if one chose to emphasize the result rather than the cause. Furthermore, we have found that even such a simple type as traumatic hemorrhage, for example, may produce a macro-, normo-, or microcytic type of anemia, depending on the intensity, and duration of the hemorrhage. For such reasons a classification based purely on size of cells seems undesirable at the moment.

Using such a tentative classification, I shall discuss briefly the different types

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\* Anemia of pregnancy and of celiac disease may occur either as macrocytic or hypochromic, depending on what element is chiefly lacking

*Aplastic Anemia* This marrow insufficiency, as you know, may be caused by a number of chemical poisons, such as arsenic, bismuth, or benzol, by physical agents, such as X-ray or radium, by some overwhelming infections, or by a terminal exhaustion of the bone marrow in pernicious anemia, leukemias, other severe anemias and even in polycythemia. Also we still have to include the "Idiopathic" types, i.e., those in which the cause is still entirely unknown. Though some of these causes frequently depress the leukocyte forming centres, they may also attack the red cell centres or all three, i.e., megakaryocytes.

In the complete form we recognize no regenerative signs either in the bone marrow or in the peripheral blood. However, we must also recognize forms in which, with no signs of regeneration in the blood stream, a relatively hyperplastic bone marrow is found (loss of expelling stimulus'), or in which more immature red cells are found in the circulation than bone marrow study would suggest. Of course, the different levels of activity of different bone marrows must here be taken into account in forming an estimate of aplasia. A tibial marrow might show aplasia, for instance, when femoral showed considerable regenerative activity, or femoral be fatty when sternum or vertebra was active.

Another rarely recognized condition is Cooley's *Erythroblastosis* of children, also called "icterus gravis" and "hydrops universalis". This produces a marked anemia in spite of the excessive signs of blood cell formation in bone marrow, liver, and spleen, because of the congenital defectiveness of the red cells that are formed. The racial element, especially its predilection for the peoples of the Mediterranean littoral, familial incidence, the presence of many nucleated red cells in the blood, splenomegaly, not helped by splenectomy, are associated features which may permit this condition to be differentiated from other puzzling anemias of childhood. This disease undoubtedly is often confused with v. Jaksch's anemia, a term which probably should be further dissected till nothing is left.

*Congenital and Acquired Hemolytic Jaundice* It is now recognized that the most important feature in this disease is that the small red cells tend to be more spherical than normal and that therefore they rupture more easily in hypotonic salt solution. This is the well known "increased fragility" phenomenon. This is often but one of several anomalies that the individual may exhibit, such as, tower skull, bone and tooth defects, and is presumably the prime fault. In fact, "acquired hemolytic jaundice" is now believed to represent latent cases of the congenital disease brought to the level of clinical prominence by the addition of some other condition, such as syphilis or gall bladder trouble. Splenectomy continues to be the treatment of choice, though a recent suggestion that it may even be performed during a crisis, i.e., without waiting for a remission or the beneficial effects of transfusion, is one that should be followed with caution and reluctance. Though splenectomy is usually followed by clinical cure, the resistance of the red blood cells seldom returns all the way to normal, another fact in favor of the view that the prime fault lies in a congenital defect of the red blood cell.

Just as congenital hemolytic jaundice may remain latent in some instances, so in sickle cell anemia we have to recognize that many persons with this condition are not anemic, i.e., sicklelmia, but are more liable to become so with any strain on the red cell system than persons with normal erythrocytes. An increasing number of established diagnoses of this condition in persons in whom negro blood can reasonably be excluded shows that we must revise our concept of sicklelmia as one occurring solely in negroes. The extremely small size of the spleen in these cases still remains a mystery.

The elliptical erythrocytes should not be confused with sickle cells. They do not show the same tendency to increase when the blood stands outside the body, nor do they show preference for negroes and are never associated with severe anemia.

Turning to much more common and therefore important conditions, let us consider the various anemias associated especially with lack of hemoglobin, hypochromic anemias, which of course give a low color index. On the stained smear the corpuscles are recognizably paler, show great variations in size, and are often distorted in shape. Not only is the mean volume of the red blood cell reduced, but also the hemoglobin concentration of each. This gives a clue to the nature of the disorder, which is a greater deficiency of iron than of stroma, according to current concepts, and also suggests the treatment, as iron is practically a specific. If iron in sufficient quantities fails to give relief, sometimes the addition of a small amount of copper will benefit, although the reason for this is not clear.

Such anemias occur from long continued hemorrhages, such as menorrhagia, oozing piles, gastro-intestinal ulcers, hookworm, from improper diet, especially if deficient in iron, after total gastrectomy, in a gastro-intestinal state preventing absorption, and from the excessive demands for iron in pregnancy. In all these the sequence leading to an iron deficiency is apparent. It is noteworthy that the first group may also produce a macrocytic type of anemia that is in some respect similar to pernicious anemia, an indication of the limitations of a classification based on the size of the red cell. In pregnancy also both the hypochromic and hyperchromic or macrocytic forms of anemia may be encountered, the latter still called the pernicious anemia of pregnancy. If the mother has not taken in enough iron for both self and fetus, the hypochromic form of anemia results and is best treated by iron, if her gastric intrinsic factor is insufficient, according to Castle's concept, or if not enough of the extrinsic factor be taken in the diet, the macrocytic form appears. It is best treated by liver extract.

Where the cause cannot be found, the term "idiopathic hypochromic anemia," must be used, though it is an admission of ignorance. The relation of this to "chlorosis"

is not clear. This once common diagnosis is now relatively rare. Few modern studies of blood and bone marrow have been made on it. Perhaps it may be included in some of the categories already mentioned.

In some cases of the old "secondary anemia," stroma and hemoglobin are reduced in equal measure, leaving an isochromic state. Such "simple chronic anemia" may be found in any of the infections or toxic states that are of sufficient intensity or duration, or in chronic nephritis, or malignancy.

The most important group of all to consider is that associated with "hyperchromic or macrocytic anemia,"—as it is now called, in which the hemoglobin formation is less at fault than other factors, such as the maturation defect that is known to be remedied by liver extract, and perhaps other still dimly envisaged factors, such as stroma formation or one leading to prompt division of the new forming cells.

As you may well realize, one of the superlative merits of Minot's discovery of the potency of liver extract was that it not only produced a means of curing a hitherto incurable disease but also started a productive line of study of a whole group of anemias which is still far from being exhausted.

We already know that conditions other than pernicious anemia may produce macrocytosis. If we accept Castle's view that adequate anti-anemic substance, formed from his extrinsic and intrinsic factors, is necessary for the maturation of normal red blood cells, then anything interfering with this adequacy will give a macrocytic anemia. Other factors such as infection, toxin, altered metabolism are secondary. How may we apply this to our macrocytic anemias? In pernicious anemia there is little if any intrinsic factor present. When it is supplied in the form of liver, or liver extract, a remission promptly follows. The anemia of sprue responds either to liver extract or to autolyzed yeast, indicating that here it is the extrinsic factor that is lacking and the same usually holds for the

macrocytic anemia of pregnancy. In the microcytic, hypochromic anemia of pregnancy, on the other hand, there is an iron deficiency due either to the deficient diet or to the extra iron demands of the fetus, and this is promptly relieved by administration of adequate amounts of iron. There is also evidence that an inability to absorb the anti-anemic substance may be responsible for the macrocytic anemia. This mechanism seems to be at least a factor in the macrocytic anemia of celiac disease, idiopathic steatorrhea, long continued tropical diarrhea, sprue, and in some post operative gastro intestinal resections and short cuts. While the occasional macrocytic anemia of diphyllbothriasis (fish tape-worm) has not been definitely explained, it is probable that it also is mainly due to dietary irregularities interfering with the formation of the "anti-anemic substance." In pellagra, also, with the frequent presence of inadequate diet and chronic alcoholism, nutritional deficiency is probably to blame for the anemia. This is reinforced by the knowledge, that liver extract will arrest the progress of neural lesions in pernicious anemia, and vitamin B will do the same in pellagra.

I have not reached the end of my classification but remaining categories less strikingly support the point of view that I have been trying to emphasize. The etiology of acute or chronic blood loss is clear in theory but we are quite in the dark as to why different degrees of acute blood loss, or different duration and intensity of chronic loss, may produce different types of anemia. Experimentally we have found that either macro- or microcytic anemia can be produced by altering these factors. We can only speculate as to the relative depletion of materials forming hemoglobin, or stroma, or governing maturation or expulsion, but already it is prudent to regulate therapeutic measures according to the type of anemia found. The same holds true for the large group of anemias due to increased blood destruction, whether from extrinsic or intrinsic causes. We must admit, however, deficiencies in our knowledge of such common conditions as the anemia of Bright's disease, and cancer. The variation in the

clinical picture appears to be due in many instances to a preponderance of different factors in different persons suffering from the same disease. Our own studies on renal anemia indicate that defective blood formation plays the predominant role. In cancer it is obvious that in some cases, hemorrhage, in other cases deficient nutrition predominate, while the question of a specific cancer toxin remains unanswered.

While the gaps in our hematologic knowledge are thus only too apparent, I have sought to give some indication of progress that has recently been made in the study of the anemias, and of the desirability of regarding them from the dynamic standpoint of disturbances in the exquisite balance of the various parts of the "erythron."





## MEDICAL EXPLORERS OF ARABIA\*

IAGO GALDSTON

When Greece and Rome were brought to dust by those corrupting forces which are the eternal concomitants of life, the disembodied culture of the Greco Roman civilization hovered like a lost soul on the brink of perdition. For a brief space in history it appeared as if the accumulated treasures of the human spirit would be lost to all eternity. The songs of Ovid and the dialectics of Aristotle, the tragedies of Euripides and the medicine of Hippocrates, richest prizes of the golden days of antiquity, pride of the Patricians and boast of the free citizen, were like the seer leaves of a blighted oak blown about by the evil winds that heralded the storm of religious strife and bigotry that was soon to envelop all of Europe.

Out of the East whence came before the Bne Israel with their fiery faith in the One God, and later the humble Nazarene, there came now a new Savior. The desert Arab for centuries confined to the arid limits of his waste peninsula, found new strength in the faith of Mohammed, and marched forth to conquer the world for Allah and his prophet. Persia and Turkestan, Syria and Armenia, Egypt, Northern Africa and Spain fell before the zeal and arms of Islam. The crescent of Mecca rose above the stars of Rome and Athens, and to the libraries and schools of the Caliphates at Bagdad and Cairo, Cordoba, Basra and Kufa, there were gathered the treasured lore of Greece and Rome. Greek originals were translated, copied and re copied in Arabic. Upon these, Arab culture built its super structure and when the modern world emerged from the Middle Ages, it was through the Arabs and not by the Latin route that it received the heritage of the past.

Hellenic medicine the Arabs learned from the Nestorian Christians, the followers of the persecuted Nestorius, patriarch of Constantinople, who, denying none of the divinity in the teachings of Christ, refused to recognize in his person both man and God, and from their Semitic

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\* Delivered before the Section of Historical and Cultural Medicine, May 12, 1937

brothers, the Jews, many of whom saw in the Allah of Mohammed the Jehovah of Abraham. The works of Hippocrates, Galen, Paulus, and of the medical encyclopedist, Oribasius, were rendered from the Greek into Syriac and Arabic, and were taught in the schools of the Caliphates. The precious flower of Hellenic medicine found in the Arab realm a firm and fertile soil, and took root therein and flourished. The well merited and enduring fame of Rhazes, Haly Abbas and Avicenna, and of the Jewish physicians and philosophers Avenzoar the Cordovan, and Rabbi Moses ben Maimon, of whom it is said, "From Moses to Moses, there is none like Moses", are witness to the greatness of Islamic culture. Of shorter span but with a comparable brilliance, Arabic medicine with that of Greece, serves as foundation to modern medicine. But four hundred years it flourished, from Masawaihi to Ibn Sina, but in this period Arabian medicine gathered together and rendered in concise and explicit text the medical knowledge of antiquity, and furthered diagnosis, parasitology, dietetics, pharmacology, surgery, dentistry, ophthalmology, hospitalization and clinics. Anatomy, gynecology and obstetrics alone were neglected, for the Koran would not allow them.

The tide of Islam which rose from Arabia, spread East, North and West, to cover Persia, Turkestan, North Africa and to reach even into France, began to recede when worldly success corrupted in his followers the ardent zeal and simple faith of Mohammed. The desert nomads were destined by their very factious nature to fail as empire builders, but for that to succeed as the intellectual ferment of their age. Like the waters of the Nile, they overflowed, covered vast stretches, and in receding left behind them rich deposits. Arabic scholars were masters in the newly founded universities of Europe, but Arabic supremacy declined rapidly during the latter part of the ninth century. Later Mohammed found new protagonists in the Mongol Turk. The Mongol, however, is of a different mettle than the Semite. Save for the Moors in Spain, who survived on

the European continent until driven out in 1492, the Arabs withdrew to the land of their forefathers, and Europe knew little of them again until our own times

The rediscovery of Arabia, Arabia Felix, of Ptolemy, is a romance whose early chapters were written in the first part of the eighteenth century. Not one but many rare and keen souls contributed to the creation of this romance, and among these were not a few ordained and novitiate followers of Aesculapius. It were as if the debt medicine owes to Arabia were in a measure repaid in its rediscovery by physicians, or by those who could procure a measure of safety and sustenance by practicing the healing art in its simple form. The fanatical Arab, jealous of his sovereignty in the land of Mecca, would tolerate the Christian or Jew, Nasirani or Jehuda, on condition only that he be a hakim, a healer. And the wandering "hakim", from Niebuhr to Doughty, dispensed simple medicaments, took notes, sketched contours, traced inscriptions and helped gather for the world of science essential but lacking data on Arabia.

It was Kaisten Niebuhr who first opened Arabia to modern Europe. Previous to him some few odd personages, Christian slaves, wandering merchants and adventurers, had ventured or were carried into Arabia, and on emerging set down their experiences and observations, with an indeterminate admixture of fancy and fact. Burton mentions and epitomizes these, naming as the most noteworthy "The Navigation and Voyages of Ludovicus Vertomannus, Gentleman of Rome", in 1503, "The Pilgrimage of Joseph Pitts to Mecca and Al-Madinah", in 1678, and the adventures of Giovanni Furati, native of Ferrara, in the early part of the nineteenth century. Interesting as these recitations are, their bearing on the rediscovery of Arabia is but slight. These reporters were gentlemen, slaves or adventurers. They were neither trained observers nor explorers armed with the zeal of scientific search. Of such, on the other hand, and to an eminent degree, was Karsten Niebuhr, who under the patronage of

the Danish court, set sail on January 7, 1761, to explore and report on the Arabian peninsula

The latter half of the eighteenth century was a period of intense intellectual activity. This age witnessed a rapid expansion of the cultural and mental horizons of all Europe. This was the period of the French encyclopedists, of Rousseau, of Voltaire, of Newton, and of Frederick the Great. Royal patronage for intellectual and cultural endeavors, for research and exploration, was common to the age. When, therefore, in 1756, J. D. Michaelis, of Göttingen, proposed to Baron Beinstorf, Minister to Frederick V, King of Denmark, that a commission of scientists be sent by the Danish court to explore the region of Yemen in Arabia, the proposal was enthusiastically accepted. Michaelis was commissioned to gather together a suitable group of scientists. He was also charged with the task of formulating a hundred pertinent questions and inquiries which the explorers were to endeavor to answer in the process of their studies.

Niebuhr was invited to join the group of scientists and to serve as geographer. There were five members in this group: Niebuhr, Peter Forskål, physician and botanist, Von Haven, philologist, Christian Charles Cramer, surgeon and zoologist, and Bauenfeind, painter. Niebuhr was the only one who survived the expedition, and he brought back to Denmark the incomplete notes of his comrades. Niebuhr was a man of extraordinary character and ability, and his "Travels and Description of Arabia", in which he incorporated the explorations, observations and findings of his four dead companions, has the quality of a literary and scientific classic. The keenness of his powers of observation is only matched by the calm, tolerant and appreciative manner in which he recorded and discussed the intimate details of the life and manners of the Arabs. Niebuhr and his companions made many observations of a medical character, and throughout the work there are scattered numerous commentaries on Arabic medicine, male and female circumcision, castration, the signs of virginity, and the like.

The narrative of Niebuhr's travels in Arabia was published in German in 1772 and in French a year later. A greatly curtailed English version was published some twenty years later.

Major Charles William Henry Sealy, of the British Army, translated portions from Niebuhr's "Description of Arabia", and these were published in 1889 as "Selections from the Records of The Bombay Government No CCXXVI"

David George Hogarth, in his most interesting volume, "The Penetration of Arabia", pays a well-merited tribute to the first of the modern explorers of Arabia. "Karsten Niebuhr", he says, "takes high rank in that small and select group of travellers, the interest of whose narratives has survived their own age, and is confessed by all intelligent readers of whatever race, generation, or special taste Niebuhr may claim to be not only the first truly scientific man who has described the peninsula, but one who has seen the land and its life with vision as clear, as comprehensive, and as sane as any successor's. Among explorers of the Near East he takes rank with Chardin and Lane. Like them he had the philosopher's eye, which sees the universal in the particular, and the essential among the accident of circumstance. Everything was not like everything else to Niebuhr. He had a just scale of relative importance, and could distinguish the transitory from the permanent features in human life. Himself singularly devoid of individual national or social prepossessions, he recorded the trivial neither about himself nor about others. The common characteristics of humanity were what appealed to him, and while he drew somewhat apart to view them, he did not conceive himself as regarding the particular people, among whom he was sent, from above. Herein, helped somewhat by the accident of his nationality and generation, he had the advantage of more modern travellers. In a day of the middle of the eighteenth century the sense of western and racial superiority was not developed enough to debar him from full sympathy with an Eastern

people Niebuhr did not see in the Yemen Arabs an interesting lower order of beings, nor in their creed and religious practice curious parodies of those of a Christian. To the usages of the native society he conformed at once without a thought of impairing his personal dignity or the prestige of his nation, and he bowed to the 'Imam' of Sana, as equal in that land to King Frederick in his own."

There was an element of the genius in Karsten Niebuhr which we see manifested, too, in his son, Barthold Georg Niebuhr, famous for his embracive studies of ancient Greece.

Dr Forskål, one of the two physicians who were in Niebuhr's party, and who paid with their lives for their venture into Arabia, left behind him two works which were posthumously published in Copenhagen in 1775\*.

Karsten Niebuhr opened Arabia to modern Europe, and many followed him and furthered the explorations he began of the desert realm. Some among these were fully qualified physicians, many, again, had neither training nor diploma, but carried with them simple medicaments and gave themselves out to be physicians, thereby gaining a measure of security and some little profit.

Of the many who followed Niebuhr into Arabia, I choose to deal with but three—Richard F. Burton, William Gifford Palgrave, and Charles M. Doughty, Englishmen all, but as divergent in character as men can be. My choice is dictated by the condition that these explorers went into the desert each in the guise of a hakim, and practiced, each in his own light, the arts of Aesculapius. Each of the three, returning to his native land, wrote out the story of his adventures. Thus were composed three classics in the literature of exploration. Doughty's "Arabia Deserta" is, in addition, a literary classic of the first order. Doughty composed his "Arabia Deserta" as a narrative poem, in "only nominally prose" form. Lawrence, himself a master of English prose, in his Introduction to the 1920 reprint of "Arabia Deserta," wrote that "he had grown to consider

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\* *Descriptiones Animalium, Flora Aegyptiaco-Arabica*

it a book not like other books but something particular, a bible of its kind" And so indeed, it is

The other condition which compels the selection of these three explorers and authors is their numerous, keen, and far spreading observations on matters and practices medical among the desert Arabs. A thorough digest of their recorded observations would make a most interesting and valuable study. At this time we can no more than scan their works.

The most widely famed explorer of Arabia, at least among the English speaking, is undoubtedly Richard F. Burton, renowned alike for his pungent "translation" of the Arabian Nights and his unique commentaries thereto, as for his "Pilgrimage to Al-Madinah and Meccah", first published in London in 1855.

Burton was born to catch the fancy of all mankind, and particularly that of the Anglo Saxons. He had true genius and the flame that carries it gracefully. He was the greatest linguist and traveller that England ever produced.\* His courage was limitless and closely matched by his resourcefulness. His independence of thought, his manhood was attested to by a long series of creditable events that began during his infancy and illumined every year and every phase of his life. His biographer, Thomas Wright, speaks of him as "one of the greatest, noblest and most fearless of Englishmen".

Burton set out on his Arabian adventure on the evening of April 3, 1853, going into Arabia by way of Alexandria, where he stopped for a while the better to prepare his guise of wandering physician. Burton is not unmindful of the moral gravity of his disguise and deception. In the story of his adventures, he early pleads with the reader "not to be led to suppose that I acted 'Carabin' or 'Sangrado' without any knowledge of my trade. From youth I have always been a dabbler in medical and mystical study. Moreover, the practice of physic is com-

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\* p. vii Thomas Wright: Life of Sir Richard Burton

paratively easy amongst dwellers in warm latitudes, uncivilised peoples, where there is not that complication of maladies which troubles more polished nations. And further, what simplifies extremely the treatment of the sick in these parts is the undoubted periodicity of disease, reducing almost all to one type—ague. Many of the complaints of tropical climates, as medical men well know, display palpably intermittent symptoms little known to colder countries, and speaking from individual experience, I may safely assert that in all cases of suffering, from a wound to ophthalmia, this phenomenon has forced itself upon my notice. So much by way of excuse. I therefore considered myself as well qualified for the work as if I had taken out a *buono per l'estero* diploma at Padua, and not more likely to do active harm than most of the regularly graduated young surgeons who start to finish themselves upon the frame of the British soldier.”

Burton's claims to an amateur's standing in the profession of medicine is not very convincing to the modern reader, for, in explaining why he rejected the proffered friendship of an Alexandrian Shaykh, he reveals a none too creditable faith in phrenology. “My brother”, says Burton, referring to the Shaykh, “had shifting eyes (symptoms of fickleness), close together (indices of cunning), a flat crowned head, and large ill-fitting lips, signs which led me to think lightly of his honesty, firmness and courage. Phrenology and physiognomy, be it observed, disappoint you often amongst civilized people, the proper action of whose brain upon the features is impeded by the external pressure of education, accident, example, habit, and necessity. But they are tolerably safe guides when groping your way through the mind of man in his so called natural state, a being of impulse, in that chrysalis condition of mental development which is rather instinct than reason.”

From Alexandria Burton went to Cairo, having succeeded in hoodwinking H. B. M.'s Consul at Alexandria, through the agency of “much unclean dressing and an



unlimited expenditure of broken English" into issuing to him a certificate declaring that Burton, of course under the name of Abdullah, was by profession a doctor \* For a medicine chest he carried a pea-green box with red and yellow flowers, capable of standing falls from a camel twice a day † As to the contents of his pea-green medicine chest, Burton reveals only the following in a footnote "Any 'Companion to the Medicine Chest' will give, to those that require such information, the names of drugs and instruments necessary for a journey, but it must be borne in mind that hot countries require double quantities of tonics and half the allowance of cathartics necessary in cold climates Sonnini, however, is right when he says of the Egyptian fellahs, that their stomachs, accustomed to digest bread badly baked, acrid and raw vegetables, and other green and unwholesome nourishment, require doses fit only for horses Advisable precautions are, in the first place, to avoid, if travelling as a native, any signs of European manufacture in knives, scissors, weights, scales and other such articles Secondly, glass bottles are useless the drugs should be stowed away in tin or wooden boxes, such as the natives of the country use, and when a phial is required, it must be fitted into an etui of some kind By this means, ground glass stoppers and plentiful cotton stuffing, the most volatile essences may be carried about without great waste After six months of the driest heat, in Egypt and Arabia, not more than about one fourth of my Prussic acid and chloroform had evaporated And thirdly, if you travel in the East, a few bottles of tincture of cantharides—highly useful as a rubefacient, excitant, et cetera, must never be omitted I made the mistake of buying my drugs in England and had the useless trouble of looking after them during the journey Both at Alexandria and Cairo they are to be found in abundance, cheaper than in London and good enough for all practical purposes "

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\* Richard F Burton Pilgrimage to Al-Madinah and Meccah, p 17

† p 26

In Cairo, Burton sought to gain in quick time a reputation for wisdom and competence as a healer. His description of the process is revealing in many respects. Writing in the first person, and directly addressing his reader: "In Europe your travelling doctor advertises the loss of a diamond ring, the gift of a Russian autocrat, or he monopolizes a whole column in a newspaper, seeing perhaps a title for the use of a signature, the large brass plate, the gold headed cane, the rattling chariot, and the summons from the seriem complete the work. Here there is no such Royal Road to medical fame. You must begin by sitting with the porter, who is sure to have bleary eyes into which you drop a little nitrate of silver, whilst you instil into his ear the pleasing intelligence that you never take a fee from the poor. He recovers, his report of you spreads far and wide, crowding your doors with paupers. They come to you as though you were their servant, and when cured they turn their backs upon you forever. Hence it is that European doctors generally complain of ingratitude on the part of their Oriental patients. It is true that if you save a man's life, he naturally asks you for the means of preserving it. Moreover in none of the Eastern languages with which I am acquainted is there a single term conveying the meaning of our 'gratitude' and none but Germans have ideas unexplainable by words. But you must not condemn this absence of a virtue without considering the cause. An Oriental deems that he has the right to your surplus. 'Daily bread is divided' (by heaven) he asserts, and eating yours, he considers it his own. Thus it is with other things. He is thankful to Allah for the gifts of the Creator but he has a claim to the good offices of a fellow-creature. In rendering him a service you have but done your duty and he would not pay you so poor a compliment as to praise you for the act. He leaves you, his benefactor, with a short prayer for the length of your days. 'Thank you' being expressed by 'Allah increase thy weal' or the selfish wish that your shadow (with which you protect him and his fellows) may never be less. And this is probably the last you hear of him.

"To resume, when the mob has raised you to fame, patients of the better class will slowly appear on the scene. After some coquetting about 'etiquette', whether you are to visit them or they are to call upon you, they make up their minds to see you and to judge with their eyes whether you are to be trusted or not, whilst you, on the other side, set out with the determination that they shall at once cross the Rubicon,—in less classical phrase, swallow your drug. If you visit the house, you insist upon the patient's servants attending you, he must also provide and pay an ass for your conveyance, no matter if it be only to the other side of the street. Your confidential man accompanies you, primed for replies to the 'fifty searching questions' of the 'servants' hall'. You are lifted off the saddle tenderly, as nurses dismount their charges, when you arrive at the gate, and you waddle upstairs with dignity. Arrived at the sick room, you salute those present with a general 'Peace be unto you' to which they respond, 'And upon thee be the peace and the mercy of Allah, and his blessing'. To the invalid, you say 'There is nothing the matter, please Allah, except the health', to which the proper answer—for here every sign of ceremony has its countersign—is 'May Allah give thee health'. Then you sit down and acknowledge the presence of the company by raising your right hand to your lips and forehead, bowing the while circularly. Each individual returns the civility by a similar gesture. Then inquiry about the state of your health ensues. Then you are asked what refreshment you will take, you studiously mention something not likely to be in the house, but at last you rough it with a pipe and a cup of coffee. Then you proceed to the patient, who extends his wrist, and asks you what his complaint is. Then you examine his tongue, you feel his pulse, you look learned, and—he is talking all the time—after hearing a detailed list of all his ailments, you gravely discover them, taking for the same as much praise to yourself as does the practising phrenologist for a similar simple exercise of the reasoning faculties. The disease, to be respectable, must invariably be connected with one of the

four temperaments, or the four elements, or the 'humours of Hippocrates' Cure is easy, but it will take time, and you, the doctor, require attention, any little rudeness it is in your power to punish by an alteration in the pill, or the powder, and, so unknown is professional honour, that none will brave your displeasure. If you would pass for a native practitioner, you must finally proceed to the most uncomfortable part of your visit, bargaining for fees. Nothing more effectually arouses suspicion than disinterestedness in a doctor. I once cured a rich Haziamaut merchant of rheumatism, and neglected to make him pay for treatment, he carried off one of my coffee cups, and was unceasingly wondering where I came from. So I made him produce five piastres, a shilling, which he threw upon the carpet, cursing Indian avarice. 'You will bring on another illness', said my friend, the Haji, when he heard of it. Properly speaking, the fee for a visit to a respectable man is 20 piastres, but with the rich patient you begin with making a bargain. He complains, for instance of dysentery and sciatica. You demand 10£ for the dysentery, and 20£ for the sciatica. But you will rarely get it. The Eastern pays a doctor's bill as an Irishman does his 'rent', making a grievance of it. Your patient will show indisputable signs of convalescence, he will laugh and jest half the day, but the moment you appear, groans and a lengthened visage, and pretended complaints welcome you. Then your way is to throw out some such hint as 'The world is a carcass, and they who seek it are dogs'. And you refuse to treat the second disorder, which conduct may bring the refractory one to his senses. 'Dat Galenus opes', however, is a western apothegm. the utmost 'Jalinus' can do for you here is to provide you with the necessaries and comforts of life. Whatever you prescribe must be solid and material, and if you accompany it with something painful such as rubbing to scarification with a horse brush, so much the better. Easterns, like our peasants in Europe, wish the doctor to give them the value of their money. Besides which, rough measures act beneficially upon their imagination. So that Hakim of the King of Persia cured fevers by the

bastinado, patients are beneficially baked in a bread-oven at Baghdad, and an Egyptian at Alexandria, whose quartan resisted the strongest appliances of European physic, was effectually healed by the actual cautery, which a certain Arab Shaykh applied to the crown of his head. When you administer with your own hand the remedy—half-a-dozen huge bread pills, dipped in a solution of aloes or cinnamon water, flavored with assafoetida, which in the case of the dyspeptic rich often suffice, if they will but diet themselves—you are careful to say, ‘In the name of Allah, the Compassionate, the Merciful’ And after the patient has been dosed, ‘Praise be to Allah, the Curer, the Healer’, you then call for pen, ink and paper and write some such prescription as this

“‘In the name of Allah, the Compassionate, the Merciful, and blessings and peace be upon our Lord the Apostle, and his family, and his companions, one and all’ But afterwards let him take bees honey and cinnamon and album graecum, of each half a part, and of ginger a whole part, which let him pound and mix with the honey, and form boluses, each bolus the weight of a Miskal, and of it let him use every day a Miskal on the saliva. Verily its effects are wonderful. And let him abstain from flesh, fish, vegetables, sweetmeats, flatulent food, acids of all descriptions, as well as the major ablution, and live in perfect quiet. So shall he be cured by the help of the King, the Healer. And The Peace’

“The diet, I need scarcely say, should be rigorous, nothing has tended more to bring the European system of medicine into contempt among Orientals than our inattention to this branch of the therapeutic art. When an Hindī or a Hindu ‘takes medicine’, he prepares himself for it by diet and rest two or three days before adhibition, and as gradually after the dose, he relapses into his usual habits, if he breaks through the regimen, it is concluded that fatal results must ensue. The ancient Egyptians we learn from Herodotus devoted a certain number of days in each month to the use of alteratives and the period was consecutive,

doubtless in order to graduate the strength of the medicine. The Persians, when under salivation, shut themselves up in a warm room, never undress, and so carefully guard against cold that they even drink tepid water. When the Afghan princes find it necessary to employ Chob Chini, (the Jin seng, or China root so celebrated as a purifier, tonic, and aphrodisiac) they choose the spring season, they remove to a garden where flowers and trees and bubbling streams soothe their senses, they carefully avoid fatigue and trouble of all kinds, and will not even hear a letter read, lest it should contain bad news.

"When the prescription is written out, you affix an impression of your ring seal to the beginning and to the end of it, that no one may be able to add to or take from its contents. And when you send medicine to a patient of rank, who is sure to have enemies, you adopt some similar precaution against the box or the bottle being opened. One of the Pashas whom I attended,—a brave soldier who had been a favourite with Mohammed Ali, and therefore was degraded by his successor—kept an impression of my ring in wax, to compare that upon the phials. Men have not forgotten how frequently, in former times, those who became obnoxious to the State were seized with sudden and fatal cramps in the stomach. In the case of the doctor it is common prudence to adopt these precautions, as all evil consequences would be charged upon him, and he would be exposed to the family's revenge."

Burton achieved his ambition in penetrating both of the holy cities, Mecca and Al-Madinah in the guise of a faithful pilgrim. In this venture he added but little to the then existing knowledge of these two cities or of the route he followed, for Burckhardt preceded him and had left him little or nothing to report on the holy cities. However, in the words of Hogarth, "the vivid style and descriptive power of his narrative attracted an audience to which Burckhardt's sober journal had remained unknown, and so greatly dominated popular fancy, that at this day those who know that any European has tried to reach

Mecca for the most part believe that Burton alone succeeded "

Burton's fancy for dabbling in things medical was not confined to his venture into Arabia. In 1875 he took an excursion into the patent medicine field and put upon the market a "patent pick-me-up, good also for the liver." This nostrum was called "Captain Burton's Tonic Bitters," the recipe of which he claimed to have acquired from a Franciscan monk. The venture failed. (Thomas Wright *The Life of Sir Richard Burton*, Vol. I, p. 259)

As a romantic figure, though less appealing than Burton, was the Englishman, William Gifford Palgrave, of Jewish extraction on his father's side, a man of versatility and mutability, for he was an officer in the Indian Army, a Jesuit priest under the name of Father Michael Cohen, a temporary convert to Mohammedanism, an explorer of Arabia, the secret agent of Napoleon III, and subsequently a virulent pamphleteer, casting scorn upon Catholicism, the Pope and the Seminarists of St. Sulpice.

Palgrave's explorations in Arabia began in 1862 and lasted one year. He traversed the Arabian peninsula from West to East from Gaza to Muscat, passing through the Central and Eastern portion of Arabia. Of the book in which Palgrave described his adventures, "Central and Eastern Arabia," Hogarth observes: "The journey which it relates is certainly among the most remarkable ever made in any part of the world. Among Arabian explorers when all counts are considered—the area covered, the risk incurred, the success attained—only Doughty can justly be compared to Palgrave. The range of the author's interests and knowledge, his intellectual capacity, and his extraordinary adaptability to the special conditions of the land he visited, distinguish him from all travellers but the very elect, and the qualities devoted to the composition of his narrative were such as rarely go to the making of a travel book."

Palgrave's disguise was that of a wandering physician. Describing himself and his travelling companion he wrote

"Mine was that of a native travelling doctor, a quack, if you will, and accordingly a tolerable dress was indispensable for the credit of my medical practice. My comrade, who, in a general way passed for my brother in law, appeared sometimes as a retail merchant, such as not infrequently visit these countries, and sometimes as pupil or associate of my assumed profession.

"Our pharmacopoeia consisted of a few but well selected and efficacious drugs, inclosed in small tight fitting tin boxes, stowed away for the present, in the ample recesses of our travelling bags, about fifty of these little cases contained wherewithal to kill or cure half the sick men of Arabia."

Palgrave did not begin his doctoring seriously until he had well penetrated into the North Central part of Arabia. In Hayel he, so to say, hung out his shingle. With an "I beg pardon of the medical faculty for my assumed title," Palgrave describes how he went about salving and dousing the Desert Bedouins.

"I sat in cross legged state, with a pair of scales before me, a brass mortar, a glass ditto, and fifty or sixty boxes of drugs, with a small flanking line of bottles. Two Arab books of medical science by my side answered all the purposes of a diploma, of English or French 'vade mecums.' I had but two, and they were concealed behind the cushion at the back, to be consulted in secret, if necessary. My companion, who did his best to look like a doctor's serving man, sat outside near the door, his duty was to enquire of comers in what they wanted, and to admit them one by one to the professional sanctuary. In the opposite room, to the right, a cauldron, a pile of wood, two or three melons, bread, dates, and so forth, promised something better than the purgatives and emetics on the left. We had, of course, put on our Sunday's best, that is, clean shirts, a more decent head gear, and an upper garment of Combaz Zaboon they here style it—in England it would pass for a flowered dressing gown. Such was our appearance on setting up



business at Hayel, while we awaited the first onset of its custom "

Palgrave's narrative, which requires 420 closely printed pages for completion, is salted through and through with numerous but in the main, disjointed observations of a medical nature. He seldom goes beyond casually observing and equally as casually recording his observations. Thus he reports observing a narcotic plant gifted with curious qualities, but he fails to identify it as *Cannabis indica*, which it undoubtedly is. Of the plant's curious qualities, Palgrave recites the following

"Its seeds, in which the deleterious principle seems chiefly to reside, when pounded and administered in a small dose, produces effects much like those ascribed to Sir Humphry Davy's laughing gas, the patient dances, sings and performs a thousand extravagances, till after an hour of great excitement to himself and amusement to the bystanders, he falls asleep, and on awakening has lost all memory of what he did or said while under the influence of the drug. To put a pinch of this powder into the coffee of some unsuspecting individual is not an uncommon joke, nor did I hear that it was ever followed by serious consequences, though an overquantity might perhaps be dangerous. I myself tried it on two individuals, but in proportions, if not absolutely homeopathic, still sufficiently minute to keep on the safe side of the risk, and witnessed its operation, laughable enough, but very harmless. The plant that bears these berries hardly attains in Kaseem the height of six inches above the ground, but in 'Oman I have seen bushes of it three or four feet in growth, and wide spreading. The stems are woody and of a yellowish tinge when barked, the leaf of a dark green colour and pinnated, with about twenty leaflets on either side, the stalks smooth and shining, the flowers are yellow and grow in tufts, the anthers numerous, the fruit is a capsule, stuffed with a greenish padding, in which lie embedded two or three black seeds, in size and shape much like French beans, their taste sweetish, but with a peculiar opiate flavour, the

smell heavy and almost sickly While at Sohar in 'Oman, where this plant abounds, I collected some specimens intended for botanical recognition at home, but they with much else were lost in my subsequent shipwreck "

Among those who explored Arabia, the connoisseurs honor no one more than Charles Montagu Doughty, Khalil in Arabia Hogarth wrote this panegyric of the man and his work

"No one has looked so narrowly at the land and the life of Arabia as Doughty, and no one has painted them in literature with a touch so sensitive, so sincere, and so sure And not only Bedawin life, of whose hardships he suffered the last, wandering as one poorer than the poorest, but also the life of the oasis towns of Nejd For even of Palgrave, who had a sympathy with town Arabs which he denied to Bedawins, the best one may say is this that his vivid picture of Hail is only less convincing than Doughty's and that his account of life in Riad is worthy to be compared with his successor's description of life in Aneiza Of the tenting society in steppes and deserts, which is of one character all the world over, and changes as little with the procession of centuries as anything human, Doughty's presentment may well be held final, for not only did he see it whole, and, despite a certain prejudice against all things Semitic, with a sympathy that has never been excelled, but he has described it in language which with all its untimely elaboration has the precision and inevitableness of supreme style One may wish, for the sake of the appeal that his great book might have made to a wider audience than the few who feel enthusiasm for Arab things and are not over preoccupied with the strangeness of his stately Elizabethan, that he had condensed his narrative and accepted the literary language of his own day But at the same time it must be allowed that the archaistic effort, sustained by Doughty's quixotic genius through more than a thousand pages of his 'Arabia Deserta,' is curiously in keeping not only with the quixotism of this 'Nasrany's' adventure in the Lions' Den of Islam, but with the primeval society he set himself to describe

"Right Elizabethan or not, no word of Doughty's best descriptions of the desert and the desert folk can be spared. Each falls inevitable and indispensable to its place as in all great style, and each strikes full and true on every reader who has seen, be it ever so little, the dusty steppe and the black booths of hair.

"His book belongs to that rare and supreme class in which the author speaks not for himself but for all who might find themselves in like case."

Whosoever loves the English language, and the witness of a stalwart soul, will as he reads "*Arabia Deserta*" subscribe to every word of praise spoken of Khalil and of his *Georgic of the Desert*.

Doughty before venturing into Arabia had wandered about the Bible lands, in Egypt and in Spain. In 1875 he applied for a grant to the Royal Geographical Society.

In the minutes of the Council of the Royal Geographical Society there is a notation to the effect that "Major Wilson's remarks on Mr. Doughty's application were read and the request was ordered to be civilly declined."

On November 10, 1876, Doughty, or Khalil as he was called in Arabia, clothed as a Syrian of simple fortune, set out on his Central Arabian adventure. Doughty, unlike Palgrave, and Burton, did not represent himself to be other than a Nasran, a Christian and an English. His profession was that of hakim, a physician. Khalil's medical *Vade Mecum* was Tavernier's "*Practice of Medicine*," his armamentarium, a few drugs, some vaccinating quills and Damascus lymph, which unfortunately proved worthless.

"*Arabia Deserta*" tells the story of Doughty's wanderings and experiences from November, 1876 to July, 1878. Unlike Burton he reached neither Medina nor Mecca, the two holy cities of Islam. Nor indeed did he much crave to do so, for in his time they were no longer "*terra incognita*." Starting from Damascus he travelled in the general direction first of southwest, then southeast, turning at Boreida and issuing from the Arabian Peninsula at Jidda. The recitation of his adventures fill 1162 closely printed pages.

There is no summarizing of his story. As soon bottle the the breath of the desert or fetch a sample of its sands in your palm. To know "Arabia Deserta" one needs to follow Khalil on his thelul, as he rides with doctors, and lives with the Beduwy.

Many have gone into Arabia after Doughty, but none has come forth with such tales as his. Now that the desert waste has been invaded by motor cars and airplanes, the great epoch of Arabian exploration has come to an end.

It remains for us to glean from the wealth of our explorers some observations on medical things and practices among the desert Arabs. What manner of men are the Beduwy and what is their conception of disease? To Doughty "the Arabians are ill nourished, and they think themselves always ailing. The nomads live nearly as the wild creatures, without certain diet, and they drink infected waters. Few have not some visceral infirmities—*el kibd*, and, the wind breathing upon their nearly naked bodies, they are crazed with all kinds of rheums, *el rihh*, a name they give to all obscure, aching diseases. Every sickness they name *wajja* 'pain, disease' the patient *wajan*.

"Inured from his youth to bodily extremities, the Beduwy can suffer a painful malady of years, and will sooner pine still, than put away his penny for uncertain cures to the Mudowwy, or man of medicine. For these Semites, feeling themselves such shrews, have no confidence in man but in God only. They would all see the leech's skill proved upon some other than themselves. Thus hardly do any come to the man of medicine till he be about to depart from them, when commonly only the most intractable or hopeless cases will be brought before him. Notwithstanding, they all love to bibble babble their infirmities, in the whole some ears of the hakim. It is lawful, they think, to come to the physician, and merit to supinely endure a disease, which (by the will of Ullah) is come upon them. If I said I had little or no hope to relieve them, they responded cheerfully 'El-Hakim (the Physician) is Ullah, He is all-

cure,'—yet some, full of melancholy, 'Ma ly ghiey, Ullah, what then remaineth unto me but the Lord?' They will give to Ullah the praise of all human service, and not pay the apothecary and they say, 'I will pay for no medicines, I will pay for the cure, trust me, Mudowwy, I will requite thee at that time as thine own heart can desire'

"It is said in the towns, 'the Beduwy's mind is in his eyes' Negligent and impatient, they judge, as they are passionately persuaded, in the seeing of the moment, and revert to their slumbering indolence

"All the Aarab would have hijabs sooner than medicals, which they find so unprofitable in the hands of their hareem The Moghrareba, Moois or 'Occidental Arabs,' are esteemed in Arabia, the best scribes of these magical scriptures, and the people suppose them to be of a wonderful subtlety, in the finding of hid treasures There are hijabs for the relief of several diseases, and against possession of the jan or earth-demons, also hijabs which should preserve life in dangers, as hijabs written against lead

"The same men catch after charms, that will not pay for medicine every wiseacre of them would purchase a hijab with reals, even were they the last in his slender purse

"Beduins sometimes gave me their hands, supposing I should be skilled in palmistry, and prayed me to read their life lot, 'whether it were fallen well to them' Some vain young men would have me divine of their faces, saying, 'Saw I any likeness in them to lucky persons?' Mankind, after the Arabs' opinion, may be vexed in their bodies and minds by possession of the jan, of which they say 'half are malignant and a half good demons, ay and Moslemim' They inhabit seven stages, which (as the seven heavens above) is the building of the under-world Strange maladies and lunatic affections are ascribed to their influence"

Of the folk medicine of the Beduwy, Burton gives the following description

"The popular treatment is by actual cautery, the scientific affect the use of diastics and astringent simples, and the Bizi al Kutn (cotton seed) toasted, pounded and drunk in warm water. Almost everyone here, as in Egypt, suffers more or less from haemorrhoids, they are treated by dietetics — eggs and leeks — and by a variety of drugs, Myiobalans, Lisan al-Hamal (Arnoglossum), etc. But the patient looks with horror at the scissors and the knife, so that they seldom succeed in obtaining a radical cure. The *Filaria Medinensis*, locally called 'Farantit,' is no longer common at the place which gave it its European name. At Yambu', however, the people suffer much from the Vena appearing in the legs. The complaint is treated here as in India and in Abyssinia when the tumor bursts and the worm shows, it is extracted by being gradually wound round a splinter of wood. Hydrophobia is rare, and the people have many superstitions about it. They suppose that a bit of meat falls from the sky, and that a dog eating it becomes mad. I was assured, by respectable persons, that when a man is bitten, they shut him up with food, in a solitary chamber, for four days and that, if at the end of that time he still howls like a dog, they expel the Ghul (demon) from him, by pouring over him boiling water mixed with ashes, a certain cure, I can easily believe. The only description of leprosy known in Al Hijaz is that called 'Al Baras' it appears in white patches on the skin, seldom attacks any but the poorer classes, and is considered incurable. Wounds are treated by Marham, or ointments, especially by the 'Balesan', or Balm of Meccah, a cloth is tied around the limb, and not removed until the wound heals, which amongst this people of simple life, generally takes place by first intention.

"In cases of fracture, they bind on splints with cloth bands, and the patient drinks camel's milk and clarified butter until he is cured. Cuts are carefully washed, sprinkled with meal gunpowder, and sewn up. They dress gunshot wounds with raw camel's flesh, and rely entirely upon nature and diet. When bitten by snakes or stung by scorpions, they scarify the wound with a razor, recite a

charm, and apply to it a dressing of garlic. The wealthy have Fiss or ringstones, brought from India, and used with a formula of prayer to extract venom. Some few possess the Tariyak (Theriack) of Al-Irak — the great counter-poison, internal as well as external—of the East. The poorer classes all wear the Za'al or Hibas of Al-Yaman, two yarns of black sheep's wool tied round the leg, under the knee and above the ankle. When bitten, the sufferer tightens these cords above the injured part, which he immediately scarifies, thus, they act as tourniquets. These ligatures also cure cramps—and there is no other remedy. The Badawi knowledge of medicine is unusually limited in this part of Arabia, where even simples are not required by a people who rise with dawn, eat little, always breathe Desert air, and 'at night make the camels their curfew'. The great tonic is clarified butter, and the Kay, or actual cautery, is used even for rheumatism. This counter-irritant, together with a curious and artful phlebotomy, blood being taken, as by the Italians, from the toes, the fingers, and other parts of the body, are the Arab panaceas. They treat scald-head with grease and sulphur. Ulcers, which here abound without, however, assuming the fearful type of the 'Helcoma Yemenense' are cauterised and stimulated by verdigris."

Particularly noteworthy is Burton's observations on the Bedoun's treatment of syphilis, which so much suggests the present-day fever therapy. "The evil of which Fracastorius sang is combated by sudorifics, by unguents of oil and sulphur, and especially by the sand-bath. The patient, buried up to his neck, remains in the sun fasting all day, in the evening he is allowed a little food. This rude course of 'packing' lasts for about a month. It suits some constitutions, but others, especially Europeans, have tried the sand-bath and died of fever. Mules' teeth, roasted and imperfectly pounded, remove cataract. Teeth are extracted by the fairier's pincers, and the worm which, throughout the East is supposed to produce toothache, falls by fumigation. And finally, after great fatigue, or

when suffering from cold, the body is copiously greased with clarified butter and exposed to a blazing fire ”

Smallpox is a plague well known to and justly dreaded by the Beduwy, who long before the Europeans, practiced inoculation Of their practices Niebuhr wrote (in 1772)

“The Bedouin women themselves inoculate their children with small pox, opening the skin of the arm a little with a thorn, for want of a better instrument It is said at Constantinople, where inoculation is much employed among the Christians, that the matter of small-pox has the same effect, when it is dried and taken through the nose, as when it is swallowed in a grape An Arab of the island of Lam (Lamu?) on the south east coast of Africa, told me at Bombay, that inoculation was common in his country and of very ancient date ”

As among all peoples, doctoring and nursing falls largely to the lot of the Beduwy woman “The Arabs”, Doughty wrote, “are cured in their maladies by the hareem, who have all some little store of drugs, spices and perfumes, fetched from Medina, and their giandam’s skill of simples, which are not many to find in their desert diras The practice of the poor affectionate women, is not all (in some malignant husbands’ surmising) to their health, men too often ascribe their slow and obscure maladies to ‘witchcraft of the hareem’ ‘See, Khalil, some patient has said, how dead is my body and wasted I am in doubt of a jealous wife, and that she has given me some cold drink’ Poisoning is familiar to the criminal imagination of all countries, and the Beduins give the name to those few herbs and condiments which they put to their food to give a pleasant savour and colour ”

Of the practice of circumcision Doughty gives the following description

“I saw more muzayyins in the camp of the Sehamma, it was early in the morning when the children would be ‘purified’ As I came by the first tent the child a moment before had been made a Moslem, but so rude was the surgery that he of the knife must be called back again The



child lamented for himself, weyley! woe is me Thereby lay an ewe, for the guest meal, gurgling in her blood with the throat cut, and now the child's father severed the sheep's head from the body I came to a second muzayyin tent, here a sany was the surgeon I saw him whetting his blade, and one held a sheep ready to be slaughtered The father encouraging his little son, set up the child and held him to ride round on the sacrificial sheep's back, then he seated him again in his place, so drawing his cutlass and with a back stroke houghing him, he cut down the mutton, he cut also the throats of a goat and a kid They now seated the child upon a vast metal charger reversed, which at other times is for the large nomad hospitality, 'the table of God in the wilderness,' some horse dung being powdered under him This smith stood still striking a rude razor blade to a fair edge, upon his sinewed arm He drew then the foreskin through a pierced stone shard, and there tied with a thread 'Look thou cut not over much,' said the mother Holding her child, with the other hand, she blinded his eyes, and encouraged him with the mother's voice and promises of sweet milk and fat things The sany, with a light stroke, severed the skin at the knot then he powdered the wound with charcoal, and gave up the child, which had not felt a pain, to his mother, and she comforting him in her bosom, bade him be glad that he now entered into the religion of Islam "

The Beduyn women for all their hardihood, bear their children in pain and sorrow "I saw Abdullah's wife," Doughty writes, "returning from the desert an hour after child bearing, she was faintly pacing home, supported among her female neighbors, that had played the midwives and as she passed by their tents the next housewives ran forth to meet her, silently taking the places of the former, and set under her elbows their hands, and so they will all bear her forward one after another, and the <sup>16</sup> bringing her to her own bayt again This is women's kindness. A day or two after, I found her standing the worm with, already she went about her household to produce toothache, a woman smiled in her pale weakness, after great fatigue, &

the child did,—her own brother would not have enquired of the babe, which was a female. I asked of a young wife in our *menzil*, if their hareem brought forth easily? She seemed a little abashed that a man had asked such a thing of her, then she said with a smile and a little rueful cry, 'I have borne but one, ih' ih' it was a smart indeed'

For all their polygamy and their facile divorce regulation, the Beduwy are not notably free of those afflictions which "parted in strife Atreus' son, king of men, and goodly Achilles", and brought ruin upon Troy. The plague of thwarted love is upon the bronze skinned Semites. "Alas!" said a poor forsaken housewife to Doughty, "look in thy book, and tell me shall I recover my goodman's love,—Oh' hast thou no charm for love? give me at least some writing that I may be pleasing in his sight again." And said a young man, "Well, Khalil, take thy reed and a paper-leaf, and move this upon that but a moment' and wilt thou not receive money, yet for my sake give me the writing, that where I love I may be beloved,—heigh' at the least that she weep for me!" And husbands came to beg a *hijab* which should reclaim to them the estranged, the fugitive, the unkind, and yet beloved *jara*. "How may paper and ink-blot save you?"—"Yet being written, Khalil, with the name of Ullah, we have seen them also very availing."

Who can gainsay him? Many more worldly than the grieved Arab Bedouin know that paper and ink blot have wrought greater miracles than the return of a loved *jara* to the bosom of her spouse. And the name of Ullah, too, is not to be prized lightly. But here we must leave Doughty, and with him, too Arabia called Felix.

Doughty was not the last to wander in the desert world. There were others, Gertrude Bell, for example, and the Blunts, T. E. Shaw, or as he is better known to us, Lawrence of Arabia, he of the "Seven Pillars of Wisdom," and most lately, Bertram Thomas.

But with Doughty, and certainly with Thomas, that era of Arabic exploration begun by Karsten Niebuhr has come to an end. In the Introduction to Arabia Felix Lawrence

wrote "Few men are able to close an epoch We cannot know the first man who walked the inviolate earth for newness' sake but Thomas is the last, and he did his journey in the antique way, by pain of his camel's legs, single handed, at his own time and cost "

To this we must agree Not that Arabia is now fully explored, not that it has yielded all its stores of wealth archeologic, anthropologic, etc No, but rather that, like the Cyclops, that breed of men sampled in Niebuhr, Burton and Doughty is not likely to be found again But there remain to us the consoling prizes of the masters' works, Arabia as they knew it, as they saw it, Arabia Felix If we may no longer explore the desert isle as of old, we can explore the works of those who did—works rich beyond description, in adventure, love, wisdom, and the breath of Arabia To those who undertake it, I promise an entrancing experience They shall say as Walter de La Mare has said

*"Still eyes look coldly upon me,  
Cold voices whisper and say  
'He is crazed with the spell of far Arabia  
They have stolen his wits away' "*



# JONATHAN HUTCHINSON

## THE LAST OF THE MULTISPECIALISTS\*

GORDON M BRUCE

The trend towards specialism in medicine was probably initiated and is certainly maintained by the belief that the human mind is incapable of becoming truly learned in more than one branch of the science. If this theory applies to the medical minds of the twentieth century, should it not apply with even more force and accuracy to those of the nineteenth? The men of that period strengthened the old bases of medicine, replacing them often enough with entirely new foundations. Then they erected with speed and precision that edifice upon which we of the twentieth century work our leisurely alterations and occasional refinements. It is interesting and may be salutary to recall that a man, who was born in the second decade of the nineteenth century and who died in the second decade of the twentieth, was capable of acquiring enough medical knowledge to justify his inclusion as a specialist in three divisions of medicine.

Jonathan Hutchinson was born at Selby, Yorkshire, in 1828, into the pious atmosphere that enveloped the Society of Friends. His family had him educated at home by a Quaker governess until he was seventeen years old at which time he was apprenticed to a Quaker surgeon, who was also a Quaker preacher, in York. In 1850 he went to St Bartholomew's in London. He lived quietly and frugally, coached medical students and made a virtue of necessity by praising his diet, a regimen of dried figs and bread. The catholicity of his interest was already becoming apparent. In 1856 he wrote on a new staff for performing lithotomy, in 1860 on inherited syphilis in the eye, and in the same year a chapter on Surgical Diseases of Women in Holmes' System of Surgery. He married a Quaker girl in 1856, and lived first in Reigate, then in Finsbury Circus. Sixteen years later the enormous increase in his practice

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\* Read before the Section of Historical and Cultural Medicine, March 10, 1937

made it necessary for him to move to larger and better quarters in Cavendish Square

*Ophthalmology* The science of ophthalmology attracted him from the first. He joined the staff at Moorfields in 1862 and became a close friend and associate of Nettleship, who was to write his obituary. It was during his connection with Moorfields that he made the discovery that interstitial keratitis is a symptom of hereditary syphilis. To this symptom he later added notched teeth and labyrinthine disease to complete "Hutchinson's Triad." He wrote on the dental defects observed in children who have had convulsions and who also have lamellar cataract, on tobacco amblyopia, hemorrhagic retinitis, and the relation of gout to diseases of the eye.

*Syphilis* It was probably his consuming interest in syphilis, the great simulator of other diseases, which led him into the field of other specialties. He published his great work on this disease in 1887, and brought out a revised and enlarged edition in 1909. He ascribed syphilis to a living and specific organism, the discovery of which, he said, "is in reserve for some future investigator." Eighteen years later, when his views were vindicated by the demonstration of the spirochaeta pallida, he was unmoved. He somewhat tartly observed, "To those minds incapable of accepting as proven anything not actually demonstrated, the discovery is invaluable."

*Dermatology* From syphilology to dermatology was a necessary and inevitable step. He collected and described all the rare cases that came to his service at the Hospital for Diseases of the Skin, in Blackfriars Road, and made sketches and models that still exist, as valuable today as they were fifty years ago. A well-known dermatologist writes, "Hutchinson was undoubtedly the first to describe the clinical feature of many now well-recognized dermatoses. Most of these conditions were subsequently described and worked out under other names, and only afterward was it found out that they were previously described by Hutchinson."

*Neurology* Hutchinson's only real claim to being a neurologist arises from his familiarity with syphilis, which naturally brought him into frequent contact with diseases of the nervous system. Indeed, one of his biographers believes that his only contribution was his undoubted influence on the mind of Hughlings Jackson, but this, in itself, was no small contribution. In any case, Hutchinson's insistence upon the routine use of the ophthalmoscope in neurologic examination laid the foundation for a great advance in neurologic diagnosis.

*Surgery* In his general surgical service at the London Hospital he was in charge of 60 beds, and was acknowledged one of the leading surgeons of London. He was not a rapid or spectacular operator, but calm, sure, and safe. He wrote, *inter alia*, on separation of the epiphysis, head injuries, diseases of the tongue, amputations, melanosis, and intussusception. His attainments were recognized in 1888 by his election to the presidency of the Royal College of Surgeons.

Hutchinson's interest in museums arose from his ideas of objective teaching. At the meeting of the British Medical Association in 1868 he suggested that an annual exhibition of models and demonstrations be arranged to mark the year's progress. From this suggestion has arisen the system of scientific and commercial exhibits which are now so valuable a part of medical conventions.

The museum in his country home at Haslemere began as a result of his interest in geology, archeology, and natural history. Space was allotted to each century, and in this space exhibits illustrating the important events and discoveries of that century were grouped. The museum soon outgrew his home and moved to larger quarters in the village. He here carried on his famous Saturday and Sunday lectures which he was to continue as long as he lived. Hutchinson also founded a similar museum at his birthplace, Selby, but this never attained the size or importance of the establishment at Haslemere, which has now become a national institution.

Less enduring but none the less important was the New Sydenham Society which Hutchinson founded in 1859 on the death of the old society of the same name. When it ceased to function in 1906 it had published, at a moderate price to subscribers, nearly 200 volumes of translations, atlases, and essays.

His private clinical museum he attempted to convert into a nucleus for postgraduate medical education in London, where this type of instruction was, strangely enough, practically non-existent at this time. Successful at first, the project soon succumbed before the hostility of the medical profession. Once again Jonathan Hutchinson was ahead of his time.

*Hutchinson as a man* In evaluating the significance of Hutchinson, his character, and the rôle he played, it is advisable to consider him against the background of the age in which he lived. He appeared upon the scene just as improvement in man's mechanical knowledge was initiating the economic change that we have come to know as the Social Revolution. The advent of steam engines had made possible improvements in transportation which brought closer the peoples of the world, facilitating easy exchange of goods and ideas. The First Reform Bill was being passed, Trade Unionism was beginning to rise, and Karl Marx was giving the initial impetus to a movement that was to play a tremendous rôle in the politics of the world. All this prepared the way for the shattering impact of Darwinism on the religious ideas of mankind. A concept of Christianity based upon an ancient Sumerian serpent-legend was shaken to its core by the unanswerable arguments of rock and river bed, of embryo and fossil. The Quaker who had refused to go to the Crimean War because of religious scruples became the friend of Darwin and Huxley and the proponent of their teachings. He was born nine years before Queen Victoria came to the throne. He was actively in practice when Florence Nightingale went to the Crimea. He was full surgeon at the London Hospital before the American Civil War had ended, and

was writing of smallpox in his Atlas while the Franco Prussian War was proving the value of vaccination. He had been in practice twenty six years before the telephone was invented, and died, within the memory of us all, just before the Great War began.

In the history of medicine his life occupies a span of similar importance. Aortic regurgitation was first described in the year he was born. He had been in practice a year before Helmholtz discovered the ophthalmoscope and four years before von Graefe introduced the operation of iridectomy for glaucoma. Lord Lister, his friend and classmate, preceded him by one year in birth and in death. In the year that Johns Hopkins was founded Hutchinson was preparing the famous illustrations that have since become a valued possession of that University. The gonococcus, and the bacilli of typhoid, tuberculosis, and diphtheria were discovered between the date that he became a fellow of the Royal College of Surgeons and the time that he became its president. He had been practicing forty-eight years before radium was discovered, and fifty seven years before the Wassermann test was introduced. He was a contemporary of Graves, Stokes, Bright, Addison, Hodgkin, Paget, Brodie, Bowman, Syme, and Huxley in his own country, and of Skoda, Hebra, Horner, Broca, Sims, His, Claud Bernard, Charcot, and Ehrlich abroad.

The stirring times in which Hutchinson lived must have stimulated a mind naturally alert and an observation phenomenally keen. He took notes on all his cases, and nothing escaped his eyes and hands. His care and industry were amazing. For example, he wished to know if his patients have had gout in the family, and described his method of eliciting information. If the patient denied a family history of gout, he would question him on a later date. If the information so obtained was unsatisfactory he would interview the relatives, several times if necessary. By this time the harassed family had probably invented a gouty relative just to be rid of this relentless inquisitor.



Because they are portrayals of the unchanging appearance of disease, Hutchinson's drawings and models are as valuable today as they were fifty years ago, and the accompanying descriptions are peerless. In this connection Osler's words are of interest. "When anything turns up," he said, "which is anomalous or peculiar, anything upon which the text-books are silent and the systems and encyclopedias dumb, I tell my students to turn to the volumes of Mr Hutchinson's Archives of Surgery, as if it is not mentioned in them it surely is something very much out of the common."

Unfortunately, Hutchinson had the failing of attempting to use his facts to draw entirely wrong conclusions. On one occasion he showed a patient with a skin eruption as a typical example of how syphilis could simulate smallpox. He disregarded the patient's denial of syphilis, only to be disconcerted by the discovery that the patient really did have smallpox. His conviction that leprosy was caused by eating decomposed fish was not shaken by the subsequent discovery of the lepra bacillus. To find support for his theory he visited India and Africa, and published his last work on the subject in 1906. This book, a masterpiece of plausibility, almost convinces the reader against his will. He drove his unwilling facts down the straight lane of his theory and, if they proved refractory, clubbed them into line. All of this was undoubtedly due to conviction. Dishonesty was not in the man. For example, he was impelled to report in detail his discovery of vaccino syphilis, despite the recriminations of his colleagues, whom he esteemed, and the plaudits of the anti-vaccinationists, whom he despised. He said, "We cannot ask that vaccination be made compulsory unless we have done everything in our power to make it safe. There is no doubt that the danger of transmitting syphilis is a real and very important one. It can be guarded against only by giving the fullest information regarding it to all the members of the profession, and by attracting their attention to it in the most forcible manner. I should deem my

self culpable in a high degree if I failed in my duty in this respect" This courageous pronouncement resulted in the manufacture of vaccine from calf lymph, and the elimination of vaccine syphilis

His prose style was sober, simple and clear but his lectures were enlivened by apt illustration and vivid metaphor. He began one of his talks on dermatology by discussing the various ring formations found in nature, progressing from the "fairy-rings" found in the fields to the circinate eruptions of ringworm. The catholicity of his interests provided a vast storehouse from which non-medical illustrations could be drawn. For outside reading he preferred Shakespeare, Wordsworth, Browning, Darwin and Carlyle, but his knowledge of other literature was wide and exact. For instance, he argued against the contention that syphilis might have originated in the Old World by pointing out that no mention of this disease can be found in Chaucer or Boccaccio. Geology was one of his hobbies and his Sunday afternoon lectures at Haslemere were often ostensibly on this science. Such a mind, however, could not be kept within the bounds of a single subject and one lecture, which he began with a discussion of the earth's crust, went on through a consideration of elephants to a dissertation on John Wesley. He loved animals and plants and his friends rallied him with the accusation that his interest in his cattle and his flowers was enhanced by the fact that they, as well as humans, sometimes suffered from disease. When in his last days it became necessary for him to remain indoors he began to study the tumors on the wood brought to replenish his fire.

At his death in 1913, at the age of 85 he had filled the chair of every important medical society in England, had represented his profession on many Royal Commissions, and had been honored by knighthood and by honorary degrees from great universities. He had reached the top in ophthalmology, dermatology, and surgery, and history will probably pronounce him the greatest syphilographer of all time. Every modern trend in medicine makes it improbable that we shall look upon his like again.

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## DEATHS OF FELLOWS

BIERHOFF, FREDERIC, 88 Central Park West, New York City, born in New York City, March 6, 1868, graduated in medicine from the College of Physicians and Surgeons in 1889, elected a Fellow of the Academy April 4, 1901, died July 30, 1937. He had been urologist and consulting cystoscopist to the Gouverneur Hospital. Dr Bierhoff was a Fellow of the American College of Surgeons, a Fellow of the American Medical Association, and a member of the American Urological Association and the County and State Medical Societies.

BLAKE, JOSEPH AUGUSTUS, born in San Francisco, California, August 31, 1864, died in Litchfield, Connecticut, August 12, 1937, received the degrees of A B in 1885, Ph B in 1886, and M A in 1909 from Yale University, graduated in medicine from the College of Physicians and Surgeons in 1889, elected a Fellow of the Academy April 4, 1895, Vice-President of the Academy January 1, 1909 to December 31, 1911.

Dr Blake had been on the faculty of the College of Physicians and Surgeons as assistant demonstrator of anatomy in 1891, instructor of surgery in 1900 and professor of surgery from 1903-13. He was at one time consulting surgeon to the Orthopedic, St Luke's, Roosevelt, St John's, Dobbs Ferry and Tarrytown Hospitals.

At the beginning of the World War, he offered his services to France and was given charge of the American Ambulance at Neuilly. In October, 1915 Dr Blake resigned this charge to accept command of the British Base Hospital at Ris Orangis. At the entrance of the United States into the war, he assumed command in August, 1917, of the American Red Cross Base Hospital No 2 at Paris. He held a commission as Colonel in the Medical Corps, USA at the time of the Armistice. For his services in France, he received the Distinguished Service Medal from the United States, and the decoration of the Legion d' Honneur from France.

Dr Blake was a member of the American Surgical Association, the American College of Surgeons, the Society of Clinical Surgeons, the Association of American Anatomists, the New York Academy of Sciences and the New York Surgical Society.

GOULD, EVERETT WILLOUGHBY, 860 Park Avenue, New York City, born in Watertown, New York, October 18, 1873, died in Hawley, Pennsylvania, August 19, 1937, received the degree of A B from Columbia University in 1896, graduated in medicine from the College of Physicians and Surgeons, Columbia University, in 1899, elected a Fellow of the Academy January 7, 1915 Dr Gould was consulting pediatrician to the St Luke's Hospital He was a trustee of Columbia University, a Fellow of the American Medical Association and a member of the State and County Medical Societies

HUNT, J RAMSAY, 46 West 55 Street, New York City, born in Philadelphia, February 1, 1872, graduated in medicine from the University of Pennsylvania Medical School in 1893, elected a Fellow of the Academy April 2, 1903, died July 22, 1937 Dr Hunt was a member of the State and County Medical Societies, the American Medical Association, the Association of American Physicians, the American Neurological Association, the American Psychopathic Society, the American Psychiatric Society, the American Society for Clinical Investigation, the New York Psychiatric Society, and the New York Neurological Society He was Neuro-psychiatrist to the Lenox Hill Hospital, and Consulting Neurologist to the Neurological Institute, the N Y Eye and Ear Infirmary, Montefiore, Craig Colony, Letchwood Village and North Westchester, and to the Mount Kisco Hospitals

MIAL, LEONIDAS LE MAI, 38 Elm Street, Morristown, New Jersey, born in Raleigh, North Carolina, July 7, 1862, died in Morristown, New Jersey August 19, 1937, received the degree of A B from the University of North Carolina in 1881, graduated in medicine from the University of Pennsylvania School of Medicine in 1887, elected a Fellow of the Academy May 2, 1907 He was eye surgeon to the Memorial Hospital Dr Mial was a Fellow of the American Medical Association and the American College of Surgeons and a member of the American Laryngological, Rhinological and Otolological Society and the County and State Medical Societies

ROOT, EDWARD KING, 990 Asylum Avenue, Hartford, Connecticut, born in Hartford, Connecticut, November 22, 1857, died in Fenwick, Connecticut, August 12, 1937, graduated in medicine from the Medical Department, University of New York in 1879, elected a Non-Resident Fellow, February 1, 1894, Associate Fellow January, 1904

Dr Root was on the staff of the Hartford Hospital for many years and was Medical Director of the Aetna Life and the Connecticut Mutual Life Insurance Company

# BULLETIN OF THE NEW YORK ACADEMY OF MEDICINE

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## COMMUNITY PROVISION FOR THE SERUM TREATMENT OF PNEUMOCOCCIC PNEUMONIAS\*

### I

#### THE PROBLEM OF THE PNEUMONIAS

It is well known that in our part of the world "pneumonia" is not only a very prevalent but a very deadly disease. The combined average lethal rate of the pneumonias is close to twenty-five per cent. As a cause of invalidism and death, the pneumonias outrank the communicable diseases of childhood. They occupy third place in the mortality bills of New York City, New York State and the United States death registration area, preceded only by the diseases of the heart and by cancer. They take a very large toll among people of the most productive age groups. There are few prevalent acute conditions which have such a high mortality or are as expensive to treat.

Within the last decade the curative value of concentrated specific immune horse serum has been established for the pneumococcus pneumonias of Type I and Type II, and evidence is rapidly accumulating that it is also efficacious in Types V, VII, VIII and XIV. The general introduction of specific serum therapy has been slow. The possible reasons for it are

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\* Report of the Committee on Public Health Relations of The New York Academy of Medicine by a special subcommittee. Russell L. Cecil, *Chairman*, Jesse G. M. Bullowa, Henry T. Chickering, E. H. L. Corwin, *Secretary*.



- 1 The lingering of the dictum that the disease is self-limited,
- 2 Hesitation on the part of general practitioners to employ serum intravenously,
- 3 The difficulty in obtaining serums and their high cost,
- 4 Lack of facilities for the differentiation of pneumococci,
- 5 Failure on the part of health authorities, except in New York, Massachusetts and several other communities, to recognize the communicable character of the pneumonias, and to urge appropriations for the free distribution of the antipneumococcus serums

The Bureau of Laboratories of the New York City Health Department, the Rockefeller Institute and several of New York's hospitals, notably Bellevue and Harlem, have made very important contributions to the development of specific therapy for pneumonia

## II

### A BRIEF HISTORICAL RETROSPECT

It has been established that the etiologic factor of lobar pneumonia in man is the pneumococcus, although other micro organisms are sometimes identified with true cases of lobar pneumonia. The following Table gives the bacterial flora in lobar pneumonia on the basis of 2,000 cases \*

	<i>Cases</i>	<i>Per Cent</i>
Pneumococcus	1913	95.65%
Streptococcus hemolyticus	76	3.8%
Pneumobacillus Friedlander	8	0.4%
Hemophilus influenzae	1	0.05%
Staphylococcus aureus	2	0.1%

It is impossible within the short space of this section to give a detailed history of the evolution of pneumonia serum therapy. Only the highlights will be touched upon.

To Weichselbaum is conceded the credit for having definitely established in 1886 the causal relation of the

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\* Cecil, Baldwin and Larsen, Archives of Internal Medicine, 40, p. 253, 1927

pneumococcus to lobar pneumonia. The discovery by Neufeld of the solubility of pneumococci in bile led to the method of differentiation between the pneumococcus and the streptococcus. Pioneering work in the utilization of immune serum in pneumonia was done by the Klemperers in 1892, followed by Eyre and Washbourn, and by Elser and Roper at New York Hospital in 1909 and 1913.\*

In 1909 Neufeld and Haendel first demonstrated the existence of antigenically different types of pneumococci. They also noted that the protective action of the anti-pneumococcus serum in mice was limited to the homologous strain of pneumococcus. In the two papers which they published in 1910 they discussed the need of type determination for effective serum therapeutics. They gave an account of the results obtained by them in treatment of patients with intravenous injections of potent antipneumococcus horse serum. They called attention to the need of administering large doses to obtain beneficial results.\*\*

In this country it was under the auspices of the Medical Commission for the investigation of Acute Respiratory Diseases of the Department of Health of the City of New York that the earliest work on the pneumococcus began. This Commission was organized at the suggestion of Hermann M. Biggs in 1904 and a special grant of \$10,000 for the work was made by the Board of Estimate and Apportionment. E. G. Janeway was the President, William Osler, Vice President, and T. Mitchell Prudden, Secretary, the other members being William H. Welch, L. Emmett Holt, Frank Billings, John H. Musser, Theobald Smith and Francis P. Kinnicutt. The cooperation of a number of outstanding bacteriologists and pathologists was secured under the leadership of Biggs, William H. Park and Anna Williams. Reports were first published in the *Journal of Experimental Medicine and Biology* in 1905, and in the *Journal of Infectious Diseases* in 1906 and 1907.

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\* Joseph C. Roper, "Serum Treatment of Pneumonia," *Medical Record*, Vol. 86, No. 5, pp. 187 and 224.

\*\* "Weitere Untersuchungen mit Pneumokokken Heilsera." *Archiv für Gesundheitsämter*, 1910, 34, pp. 293-301, 36, p. 166.

In Part I of the Report of the Commission, published in 1905, there appeared a paper by Katherine R Collins, of the Bureau of Laboratories of the City Department of Health, in which the following conclusions were presented

- 1 "Pneumococci, by reason of their agglutinating properties, exhibit a tendency to separate into numerous groups similar to streptococci "
- 2 "Pneumococcus mucosus forms a distinct and consistent variety The production by it of common agglutinins for some pneumococci and the resistance of the agglutinins produced by it to absorption by the streptococcus indicate a nearer relation to the former than to the latter organism "

Further contributions to the biology of the pneumococci were made by Dochez and Gillespie of the Rockefeller Institute in 1913, and by Dochez and Avery in 1915 Their studies showed that there were at least three distinct and fixed types of pneumococci designated respectively as Type I, Type II and Type III, which comprised about 80 per cent of all the strains of pneumococci encountered in patients with lobar pneumonia The pneumococci which were found in the other patients were for the most part unrelated to one another and were designated as Group IV

This work led to extensive clinical studies with unconcentrated antipneumococcus Type I serum at the Rockefeller Institute by Cole and Dochez (1913), and later by Avery, Chickering, Cole and Dochez (1917) In 1920, Cecil and Blake showed that monkeys inoculated with a fatal dose of pneumococcus Type I could be protected with specific Type I horse serum

As a result of the influenza pandemic of 1917 and 1918, the Metropolitan Life Insurance Company appointed a Commission known as the Influenza and Pneumonia Commission of the Metropolitan Life Insurance Company This Commission held its first meeting on July 15, 1919 It consisted of Milton J Rosenau, Chairman, William H Park, G W McCoy, W H Frost, E O Jordan, Lee K Frankel and Augustus S Knight, Medical Director of the

Metropolitan Life Insurance Company The Commission is still in existence, with the same Chairman, but with a changed membership During the year 1920, the work of the Commission was limited to epidemiologic and immunologic studies of influenza In the following year a series of studies on the prophylactic use of influenza vaccines was made and experiments carried on in New York and Massachusetts with pneumonia vaccines At that time it was found that the extracts of the pneumococcus had no better prophylactic virtues than the vaccines usually made

The refinements in the production of the pneumococcus immune serum were due to a number of workers New York City was the pioneer in this field, the first really practical method for concentrating a specific immune serum, namely, diphtheria antitoxin, having been devised in the Bureau of Laboratories of the Health Department by Robert B Gibson in 1905 Subsequently, various modifications and improvements were made by Banzhaf, also in the Bureau of Laboratories of the Department of Health

In 1915, Gay and Chickering were the first to show that the immune bodies in pneumococcus serum could be separated by biologic methods Further fundamental work along these lines was done by Huntoon Though Huntoon's antibody solution possessed definite therapeutic value, it frequently caused severe and sometimes fatal reactions It was used in the treatment of several hundred patients at Bellevue Hospital

In 1924, working under Rosenau at Harvard University, Felton developed a concentrated antibody solution by precipitating the euglobulins with large quantities of distilled water The production of Felton's serum was aided by a grant of \$10,000 for three years, which was placed at the disposal of Dr Park by Mr Lucius N Littauer, who, by subsequent grants, is said to have given the sum of \$120,000 toward the study of pneumonia The value of Felton's serum was conclusively demonstrated at Bellevue Hospital by Cecil and Suthffe and by Cecil and Plummei, and at Harlem Hospital by Bullowa and Rosenbluth

At this time, with the aid of another grant by Mr Littauer, the first effective antipneumococcus Type II serum was produced at Otisville and refined by Felton Its clinical value was demonstrated when it was used on the first, second or third day Its efficacy in cases presenting bacteremia was proved by Baldwin at the New York Hospital

In 1926, Georgia Cooper, and her co workers at the Bureau of Laboratories of the Department of Health, began the publication of a series of studies on the different strains of pneumococci, which had been previously classified as Group IV, and succeeded in resolving them into 29 types They obtained pure cultures and antisera for each type In the words of Rosenau, "This is considered one of the outstanding pieces of work of the Metropolitan Influenza and Pneumonia Commission " As a result of these studies the species of pneumococcus is now divisible into 32 types, each designated by Roman numerals \* Some of these types are more prevalent in adults, others in children

In 1928, with the aid of funds given to New York University through Dr Park, and in 1930, through funds given to Dr Charles Hendee Smith by the Commonwealth Fund, and as the result of a study of pneumonias in children at Harlem Hospital through funds given Dr Bullowa by the Littauer Fund, Types I, VI, XIV and XIX were recognized as the most common invaders of children Further work in this field was financed by the Altman Foundation for the production and testing of serum for additional types that were associated with pneumonia in children

In 1929, reports of the value of concentrated serum for the newer types began to be published The clinical evaluation of the newly segregated types, V, VII and VIII, was largely the work of the Harlem Hospital workers, under the Littauer grant This work was subsequently confirmed by the Boston City Hospital group

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\* Some of the types are so closely related that the question has arisen whether they should be continued as separate entities, this applies particularly to Type XXVI, which is being classified with Type VI, and to Type XXX, which is now being classified with Type XV

At that time an appeal was presented to the Commonwealth Fund by the Massachusetts Department of Public Health for a pneumonia study and service. The clinicians who experimented with the use of the serum in Boston were unanimous in believing that the serum should be distributed, the product made more potent, the cost lowered, and reliable data obtained on the dosage required if the benefits to be derived from the antipneumococcus serum were to be enjoyed by all those who stood in need of it. The Commonwealth Fund made the first grant in 1930, with the expectation that the demonstration would continue for five years. An advisory committee, under the chairmanship of Dr. George H. Bigelow, then Commissioner of Health of the State of Massachusetts, was organized, and Dr. Roderick Heffron became the executive who carried on the field work. The demonstration had a twofold objective, "the evaluation of pneumonia serum under the conditions of the general practice of medicine, and the development of plans for the distribution of this serum for the treatment of those patients who might reasonably be expected to benefit from its use."\* It thus embraced problems of scientific research as well as of administrative procedure.

It is now recognized that the most effective use of serum depends upon the administration of the required amount in the shortest possible time. This is practicable only when the serum is of high titer. Felton's concentrated horse serum permits larger doses to be administered in smaller bulk and more effectively, it simplifies the procedure and reduces the incidence of primary reactions and of serum sickness.

Experiments are now being conducted by Goodner, Horsfall and McLeod at the Rockefeller Institute with unconcentrated but processed rabbit serum, and at Harlem Hospital under the direction of Bullowa with concentrated rabbit serum. Their limited experience to date indicates

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\* "The Commonwealth" Final Report of the Massachusetts Pneumonia Study and Service, 1931-1935, p. 4

that rabbit immune serums have definite biologic advantages over horse immune serums

### III

#### DEVELOPMENT OF THE RAPID METHOD OF PNEUMOCOCCUS TYPE DETERMINATION

In view of the importance of early recognition of the type of pneumococcic infection for successful therapy, the development of the technique of rapid type determination from the sputum is an important milestone in the evolution of the specific treatment of pneumonias. The pioneer work in this field was done by Krumwiede and Noble of the Bureau of Laboratories of the New York City Department of Health, who in 1918 worked out a method whereby they were able to differentiate the types from the sputum within a comparatively short period of time, its reliability was not established. Later Sabin devised the stained slide agglutination technique which saved time and material. The original methods of typing required considerable quantities of mouse peritoneal exudate for the agglutination tests.

Although Neufeld had described in 1902 the specific capsule swelling reaction, occurring when the pneumococci are acted on by the homologous immune serum, he appears not to have recognized its applicability to typing until nearly thirty years later. In 1931, in a study with Etlinger-Tulczynska\* he described the reaction again, and in a footnote, stated that it was a convenient method for determining types of pneumococci. Credit for introducing the Neufeld swelling reaction for direct typing of sputum in Great Britain goes to Richard R. Armstrong of St Bartholomew's Hospital, and to W. R. Logan and J. T. Smeall of the Royal Infirmary of Edinburgh, who reported it simultaneously in the British Medical Journal of January 30, 1932. It was introduced in this country in 1932 by Goodner at the Hospital of the Rockefeller Institute, and was first described here by Sabin early in 1933, after a

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\* Zeitsch f Hyg u Infektionskrank, Vol 112, fasc 3, p 492

test of it in 100 cases at Bellevue Hospital (J A M A , 100, p 1584) In 1934, Beckler and MacLeod reported on the use of the method at the Bacteriological Laboratory of the Massachusetts Department of Public Health in 760 specimens of sputum over a period of 16 months (J Clin Inv 13, p 901) On September 3, 1934, at a meeting of the American Public Health Association in Pasadena, Cooper and Walter reported on the reliability of the Neufeld reaction as ascertained in the tests made at the Bureau of Laboratories of the Department of Health in New York City (Am J P H , 25, p 469) Bullowa established the accuracy of the Neufeld method by direct cultures from the lung and blood

#### IV

#### PNEUMONIA PREVALENCE IN NEW YORK CITY

Although pneumonia has been a reportable disease in New York City for many years the Health Department figures fail by a considerable margin to reflect the true number of cases of pneumonia in the City An approximation of the divergence can be obtained by a comparison of the 16,972 reported cases of pneumonia in the year 1933, with the 20,163 patients with pneumonia known to have been discharged from the hospitals in that year This discrepancy becomes even wider when it is realized that not all of the hospitals in the City were included in the study, nor were institutions other than hospitals The prevalence of the pneumonias can therefore be only approximated from the mortality rate The total number of pneumonia deaths has been decreasing annually since 1931, except for a slight upswing in 1936 During the last six years the number of deaths from pneumonia in New York City varied between 6,400 and 9,200 The average for the last three years has been 6,500 deaths Assuming a case fatality rate of 25 per cent, the average number of cases of pneumonia during the last few years has been 26,000 per annum There are no statistics to indicate how many of these pneumonias were of pneu-



nococcus origin, but assuming that 95 per cent of the lobar pneumonias, and 75 per cent of the bronchopneumonias were of this etiology, the total pneumococcic infections numbered 22,000. When the very young and the very old are eliminated it is safe to say that about 10,000 patients would be benefited by specific serum therapy. This figure should be borne in mind when plans are laid for the supply of antipneumococcus serum for New York City.

## V

### TYPE INCIDENCE IN PNEUMOCOCCIC PNEUMONIAS

Many epidemiologic studies have been made of the types of pneumococcus found in patients ill with pneumonia. Considerable variations in the percentage distribution of the prevalent types have been observed. The latest study available is that of Bullowa and Wilcox, published in the March 1937 issue of *Archives of Internal Medicine*, which analyzes the distribution of the pneumococcus types and their variations in incidence and mortality for adults and children, on the basis of 3,371 cases treated at Harlem Hospital from July 1, 1928, to June 30, 1936. This study shows that among adults there are considerable variations in the several types of pneumonia from year to year, that Type I is consistently the most prevalent, followed by Types III and VIII, although in the year 1934-1935, Type V was next in prevalence to Type I, and in 1935-1936, Type VII took that place. The conclusion drawn from this study is that the endemic pneumonias are a series of diseases which vary in occurrence from year to year and from month to month, and that further studies of this character are needed to determine whether the specific types of pneumonia have individual cycles. The study also shows that there is a marked difference in the types of pneumonia found in children and adults living in the same community.

The variation in the prevalence of the pneumococcus types from year to year makes it difficult for the Bureau of Laboratories always to have adequate amounts of the dif-

ferent immune serums available to meet changing conditions

## VI

### ORGANIZATION OF PNEUMONIA CONTROL IN MASSACHUSETTS AND NEW YORK STATE

The modern practical application of the antipneumococcus serum had its birth in New York City. As far back as 1911, the Research Laboratory of the Department of Health began the production and limited distribution of a polyvalent antipneumococcus serum made from strains prevalent at that time.

Four years later the Division of Laboratories and Research of the New York State Department of Health prepared Type I specific antipneumococcus serum for general distribution, and in 1917 sputum typing was added to the list of procedures required for qualification of approved public health laboratories rendering such service.\*

In 1917 the Massachusetts Department of Health likewise undertook the production and distribution of pneumonia serum. The difficulties associated with the administration of unconcentrated serum and the frequency of severe serum reactions were responsible for the slow adoption of this mode of therapy. The intensive five year pneumonia study and demonstration carried on in Massachusetts from 1931 to the end of 1935, with the financial aid of the Commonwealth Fund, paved the way for an effective plan of administrative organization.

In the fall of 1935, the New York State Department of Health undertook to organize a comprehensive pneumonia control program embracing not only the production and distribution of concentrated antipneumococcus serum, and the expansion of available laboratory facilities, but also active participation in graduate professional information, in lay education, in the expansion of public health nursing service to pneumonia patients, and in research on the epi-

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\* Edward S. Rogers, "Control of Pneumococcus Pneumonia," *American Journal of Public Health*, February 1937, p. 133.

demiology of pneumonia and the evolution of more adequate means for its control. This program was undertaken with the close cooperation of the State Medical Society and the New York State Association of Public Health Laboratories, with financial aid from the Metropolitan Life Insurance Company and the Commonwealth Fund.

In Massachusetts the serum for Type I and Type II pneumonia is being produced for general distribution through a system of so called laboratory supply stations. There are 72 such stations scattered throughout the State. Thus far, only concentrated serums Type I and Type II are available to all physicians in the State. No charge is made for serum, regardless of the financial condition of the patient. Preparations are being made for distribution also of the therapeutic serums for infections of Types V, VII and VIII. This likewise is to be furnished without charge. In the distribution centers the Neufeld method of typing is used almost exclusively. In a few instances the Sabin or slide agglutination method is employed, either alone or in conjunction with the Neufeld method.

In order to conserve the available serum and to make it go as far as possible, two restrictions are being observed. No serum is given until the laboratory report indicates that the patient for whom it is requested is suffering from Type I or Type II infection, and then only for patients who have been ill for not more than four days. Physicians are requested to sign cards to this effect. Physicians who have received serums are expected to furnish the Department of Health with information concerning the patient after determination of the case. According to official report the two restrictions mentioned have encountered little criticism, although it would seem that it is very difficult to determine precisely the duration of the pneumonia from its onset to the time when the typing is done. The Massachusetts authorities are of the opinion that this time restriction aids in emphasizing the necessity of early typing and early treatment, which is so important in pneumonia. They admit that there are patients who, after the fourth day of illness, might be benefited by the administration of serum.

they are, however, prevented from changing the rule because of economic considerations. The distributing centers are authorized to issue serum in amounts of 60,000 units for Type I and 100,000 units for Type II. An additional 60,000 units for either type is permissible for the following three categories of patients:

- a Maternity patients
- b Patients having a positive blood culture with Type I or Type II pneumococci in their blood, and
- c Patients whose temperature does not fall to  $101^{\circ}\text{F}$  or under within eighteen hours, or in whom the temperature, after having fallen, has again risen to, or above,  $101^{\circ}\text{F}$  in forty eight hours

In individual instances more than 60,000 units is given for the treatment of patients with persistent bacteremia, or to pregnant women.

Arrangements are under way to allot larger amounts of serum for older patients as it has been demonstrated that persons past middle age do not gain as much benefit from an average amount of serum as do younger persons.

In New York State the regulations differ somewhat from those of Massachusetts. Up to the beginning of this year only concentrated Type I antipneumococcus serum was distributed. During the year 1936, approximately 5,700 vials of 20 c c each of concentrated Type I were distributed. The 20 c c vials of Type I contain 25,000 therapeutic units. Type II is put up in 24 c c vials, containing 20,000 units, and its distribution began only on December 30, 1936.

The serums are distributed through laboratory supply stations. There are 106 of these for the distribution of Type I serum and 34 for Type II serum. The number of the latter will be increased as the need is demonstrated and the supply of serum becomes sufficient to meet increased demands.

In New York State, as in Massachusetts, the serums are given away entirely free to all classes of patients, but there is no restriction as to time limit for its administra-

tion It is left entirely to the physician's discretion He is, however, requested to fill out a form, giving certain fundamental data in order to obtain the serum In New York State the minimum dosage recommended is considerably higher than that in Massachusetts—100,000 units for Type I cases and 160,000 for Type II cases

## VII

## SERUM PRODUCTION IN NEW YORK CITY

The New York City Health Department Bureau of Laboratories has been producing and distributing antipneumococcus serum for eleven of the more prevalent types The Table here produced gives the statistics of production of the various types during the years 1935 and 1936, in terms of vials

## PRODUCTION

## NUMBER OF VIALS OF ANTIPNEUMOCOCCIC SERUM DISTRIBUTED FOR THERAPEUTIC USE DURING 1935 AND 1936

Types of Serums	1935			1936		
	Uncon- cent (1)	Concent (2)	Total	Uncon (1)	Concen (2)	Total
I & II						
(Bivalent)	3,646	1,191	4,837	2,548 (3)	1,416 (3)	3,964
II & V						
(Bivalent)	170 (3)	339	509		236 (3)	236
III & VIII						
(Bivalent)		413	413		25 (3)	25
I	1,292	466	1,758	1,613 (3)	615 (3)	2,228
II		273 (3)	273		1,501	1,501
IV		352	352		174 (3)	174
V	380	385	765	333 (3)	682	1,015
VI		253	253		88	88
VII	567	390 (3)	957	794 (3)	110 (3)	904
VIII	706	366	1,072	1,234	778	2,012
IX		145	145		165	165
XIV	234	307	541	502 (3)	72 (3)	574
XVIII		123	123		328	328
XIX		39 (3)	39		91 (3)	91
Total	6,993	5,042	12,037	7,021	6,281	13,305

(1) Vials containing 25 c c unconcentrated antiserum—potency 800 to 3,000 units per c c—average 1,000 units per c c

(2) Vials containing 10 c c concentrated antiserum—potency 800 to 8,000 units per c c—average 2,000 units per c c

(3) Available only during part of period

The production of effective serums for the different types of pneumonia is not a simple matter. Horses must be immunized over an average period of almost fifteen months to develop antibody content of sufficient potency, some horses respond better than others. During the past few years the Bureau of Laboratories has maintained at Otisville an average of about forty horses for antipneumococcus serum. Part of the work involved in the process of concentration of the serum is done in New York City.

During the past year the Bureau of Laboratories of the Health Department produced \$85,000 worth of antipneumococcus serum. It is estimated that each horse produces about \$2,000 worth of serum per year. These figures are based on the actual cost of production and are the same as those of the Massachusetts State Health Department Laboratory, namely, \$35 per 1,000 units of concentrated serum, Type I and Type II. The cost varies somewhat with the type and whether the serum is monovalent or bivalent. For practical purposes, \$35 per 1,000 units is a basic figure. Assuming the average therapeutic dose to consist of 100,000 units, the average cost of serum per patient is \$35.

In planning for the future the Department of Health in this City must determine the extent to which the City is ready to make available this life saving remedy to all those in the population who are unfortunate enough to develop the disease, and who are unable to purchase the serum from commercial laboratories.

It is the opinion of this Committee that in view of the communicable character of the pneumococcic infections and their mode of spread through congestion in places of work, in public conveyances, schools, etc., the city should provide this serum on the same basis as it provides all other biological products — serums, antitoxin, toxoids and vaccines.

The cost of community provision of antipneumococcus serum can readily be established if the demand is forecast. In Part IV of this Report it has been estimated that on the

average, 10,000 persons in New York City may be in need of serum during the year. In view of the slowness with which this specific serum therapy has been adopted, it is unlikely that a maximum demand will develop during the next year. It is more likely that the demand may not exceed the requirements of 5,000 persons. On the basis of \$35 as the average cost, the expenditure for serum which the City would have to incur would be \$175,000. It is possible that the demand in the future may exceed this estimate. In the opinion of this Committee it is advisable for the City to plan for the increased production of the serum rather than depend on the supply from commercial laboratories. In view of the experiments with rabbit serum it is possible that in the future, most, if not all of the antipneumococcus serum may be produced in rabbits. This may decrease the cost.

### VIII

#### FACILITIES FOR CLINICAL CONSULTATION AND FOR TYPING

The successful administration of serum is a highly technical procedure requiring expert knowledge. Advice is often asked of the Bureau of Laboratories concerning technical procedures and no one with the necessary clinical experience and time is as yet available to render the required service. It is the opinion of the Committee that a consulting service should be established, similar to that provided by the Laboratory in connection with meningitis and other communicable diseases of the central nervous system. It should be headed by a physician well trained in the knowledge and technique of serum therapy. A physician of this character should command a salary commensurate with the chiefs of other clinical services in the Department of Health. In addition, the Health Department should make arrangements with a number of men located in various districts of the City who are well known for their competence in this field, and who would be willing to respond to calls for consultation service at moderate fees which the City would be able to pay. It has been estimated that for a time at least about ten such men would be

required to answer the emergency calls. The cost of such a consulting service, exclusive of the salary of the Supervisor, would probably not exceed \$10,000.

As has already been stated, the effectiveness of serum therapy depends on its early administration. Facilities should be provided for quick diagnostic laboratory service. It is suggested that at least one laboratory be established in every borough for type determination, these laboratories to be centrally located and available daily to all physicians from ten to six o'clock or later. In view of the fact that such diagnostic laboratory work is sometimes needed during the night it is recommended that one of the laboratories be maintained throughout the night. Each laboratory would require two technicians. The Committee therefore recommends that provision be made for fourteen technicians (two for each of the six typing stations and two to act as substitutes). The average salary of a technician is about \$1,000 a year. This would add to the budget about \$14,000 annually. Not all of this sum should be charged to pneumonia because during the months when pneumonia is not prevalent these technicians would be assigned to other work in the Bureau of Laboratories, which is understaffed.

## IX

### THE PNEUMONIAS AS A PUBLIC HEALTH PROBLEM

Early recognition and early serum treatment are needed to check the spread of the pneumonias. Treatment of the pneumonias requires the same aseptic technique that applies to other communicable diseases. The incidence and mortality of communicable diseases has been lowered by segregation in special hospitals. It is therefore recommended that the pneumonia patients treated in hospitals be properly segregated and cubed.

In view of the emergency character of the pneumonias, the hospitals should consider pneumonia patients in the same category with acute surgical cases, both from the standpoint of immediate preferential admission and of emergency service, night or day, by responsible members of the clinical and the laboratory staffs.



## X

## RECOMMENDATIONS

1 During the next few years the City Department of health should engage in a vigorous campaign against pneumonia. It should establish a Division of Pneumonia Service in the Bureau of Laboratories, headed by a properly qualified physician.

2 Through the regular medical channels physicians should be made cognizant of the fact that serum is life saving in certain types of pneumonia and that the particular type of pneumococcic infection from which the patient may be suffering should be determined at the earliest possible moment. Facilities for the rapid determination of the type of infection should be made available at public expense at conveniently located points throughout the City. At least one such center should be maintained in each borough from ten in the morning until late in the evening, and at least one laboratory should be available for type identification during the night.

3 Because of the communicable nature of the pneumonias it is highly desirable that pneumonia patients in hospitals be segregated in cubicles, and that a complete aseptic technique be followed.

4 Pneumonia patients should be considered in the same urgent category with emergency surgical cases. Certain physicians on the attending staff should be made responsible for the treatment of these patients and should be on call day and night, as is the custom on the surgical services.

5 In connection with the Division of Pneumonia Service of the Department of Health, a clinical consultation service similar to that rendered by the Meningitis Division should be established to aid physicians in the administration of serum therapy, and in the taking of specimens of blood and sputum for bacteriological study.

6 In all instances of death from pneumonia, physicians should be requested to report the precise nature of the invading organism.

7 Concentrated serum for the prevailing types of pneumonia should be made available without cost to physicians requesting it, provided the type of pneumonia has been ascertained prior to the request for serum

8 The control work of pneumonia and the production of therapeutic serums should in no way be allowed to interfere with the fundamental research activities of the Bureau of Laboratories of the Department of Health

9 Adequate funds should be provided to the Department of Health for pneumonia control work and to further the necessary research The minimum budget required for the year 1938 is estimated at \$225,000, of which \$85,000 is for the continuance of production of serums on the present scale, \$100,000 for the purchase of additional serums pending the development of production facilities at Otisville Farm, and \$40,000 for the salary of the chief of pneumonia control, the payment of consultants' fees, for equipping diagnostic type determination centers, for the maintenance of technicians at these laboratories, and other incidental expenses

10 It is estimated that a capital outlay of about \$200,000 may be required for the construction of new stables at Otisville to house additional horses, for the required extensions to the Laboratory, for the residence of the additional personnel required, and to meet other expenses incidental to the increase in the production of the serums Should the use of rabbit serum prove efficacious, the cost of the construction for housing the animals would be much lower than estimated It is recommended, however, that the entire sum be appropriated so that the Department of Health may be in a position to meet emergencies during the next year promptly

11 It is recommended that the serum produced as a result of the recent State appropriation of \$400,000 under the Hawkins Schwartzwald Act be made available to all parts of the State, including the City of New York, in proportion to their relative requirements, as a supplement to the pneumonia control work of local communities

July 1, 1937

## ROBIN AND JOHN ADAIR\*

ARCHIBALD MALLOCH

A short time after the close of the European War in conversation in London about early Canadian affairs with the late Sir Arthur George Doughty, in charge of the Public Archives of Canada at Ottawa, I was informed that the surgeon shown in the painting of the *Death of Wolfe*, by Benjamin West, (Fig 1) was Robert Adair the hero of the famous song *Robin Adair*. The former half of this statement was corroborated in Stephen Paget's well known life of John Hunter, *Man of Science and Surgeon*, in the "Masters of Medicine Series" in which it is said that in 1760 John Hunter received his appointment as Staff Surgeon on the expedition to Belle-Isle from the Inspector General of Hospitals, Robert Adair, who had been with the army at the siege of Quebec.

You can imagine my astonishment when I consulted Col William Johnston's authoritative work the *Roll of Commissioned Officers in the Medical Service of the British Army*, (Aberdeen, 1917), to discover no mention of Robert Adair's having served in Canada, but an allusion to the song. It seemed very unlikely that Johnston would not have found some official record of Robert Adair's appointment to the expedition against Quebec, had such been made. The notice of his death in the *Gentleman's Magazine*,<sup>1</sup> related no service in Canada. So I determined to try to clear up the matter, and on a subsequent visit, in 1924, to the Public Archives at Ottawa, Sir Arthur Doughty helped me to the utmost by allowing me to examine original manuscripts and by having copies of documents made. We found nothing to place Robert Adair definitely at Quebec in 1759, the year after his marriage. We did discover, however, that a John Adair was a surgeon with Wolfe. It was good to see that in Dr J Clarence Webster's book *Wolfe and the Artists, a Study of his Portraiture*, (Toronto, 1930, p 69), it is stated that Robert Adair's portrait is wrongly painted in the famous picture, and that "a study of the

\* Read 14 December, 1936, before the Historical Section of the College of Physicians of Philadelphia



Figure 1

Photograph of Benjumin West's Death of Wolfe  
(Reproduced by Permission of the National Gallery of Canada, Ottawa )

army records proves that he was never at Quebec nor even in America " Dr Webster writes "It was John Adair who was a prominent surgeon with Amherst's forces in America, though he was not with Wolfe's army at Quebec, as far as is known " Dr Webster's little book, by the way, is gracefully dedicated to a Fellow of this College, Dr R Tait McKenzie, whose fine statue of Wolfe, as you know, stands in Greenwich Park not far from the Royal Observatory

It is not difficult to explain why we do not know anything very definite about the Army surgeons of that time or why more mention is not made of them, for, as R Hamilton wrote in his book *The Duties of a Regimental Surgeon*,<sup>2</sup> "the Surgeon is held in an inferior light to the youngest ensign, and the King himself considers him so " Col Johnston in his *Roll of the Army Medical Service*, also mentions this lack of esteem in which the surgeons were held when he says (p xxv) "The pay and position of an Army Medical Officer was not attractive, so that a custom arose by which a Surgeon or Surgeon's Mate often purchased in addition the commission of an ensign, so adding to his pay and regimental status "

There is something very interesting about the painting of Wolfe, which was exhibited at the Royal Academy in 1771 and therefore had probably been painted shortly before, for the soldiers are represented in modern costumes instead of those of Greeks or Romans Sir Joshua Reynolds and the Archbishop of York called on West when they heard of his intention to make such an innovation, but they could not dissuade him West<sup>3</sup> said

The event to be commemorated happened in the year 1759, in a region of the world unknown to the Greeks and Romans, and at a period of time when no warriors who wore such costumes existed The subject I have to represent is a great battle fought and won, and the same truth which gives law to the historian should rule the painter

Reynolds<sup>3</sup> later said, very handsomely

West has conquered, he has treated the subject as it ought to be treated I retract my ob

jections I foresee that this picture will not only become one of the most popular, but will occasion a revolution in art

Which Adair is it that appears in the *Death of Wolfe*? It is a difficult question to answer, and it is also difficult to ascertain when it was first thought that Robert Adair was represented as the surgeon kneeling beside Wolfe. William Woollett executed an engraving, after West's painting, which was published in 1776. At the same time, he published a "Key to Six of the Portraits with the names affixed to each." Number 6 on the list is "Mr Adair, Director and 1st Surgeon of the Hospital" without giving any Christian name. Louis Fagan<sup>4</sup> also states that several men depicted in West's painting were not at Quebec and adds that "Surgeon Adair, who is represented in attend-



Figure 2

Photograph of Mezzotint of Robert Adair by John Jones  
after a Painting by F. L. Abbott

(By Permission of The New York Public Library)

ance, was then at Crown Point", which is in Northern New York. As we shall see, official records show that John Adair was "Surgeon to the Hospital", that is, not just a regimental surgeon, and was at Quebec where he was *acting* Director, so Woollett's description applies to him. Someone then confused the two men and the *British Museum Catalogue of Engraved Portraits*<sup>5</sup> states that Robert Adair was the surgeon depicted.

Figure 2 is a reproduction of a mezzotint of Robert Adair by J. Jones, after L. Abbott for comparison with an enlargement of the surgeon in the *Death of Wolfe*, (Fig. 3). I leave it to you to decide whether they are pictures of the same man. Is it the same chin in both? I am sorry that I cannot find a picture of John Adair to compare it also with the portrait in the Wolfe painting. Dr. Webster<sup>6</sup> points out that "some unpleasant gossip" has come down that West asked payment of men for the privilege of



Figure 3

Enlarged Photograph of the Surgeon in Benjamin West's  
*Death of Wolfe*

(Reproduced by Permission of the National Gallery of Canada, Ottawa.)

having their portraits painted as if they were present at the time of Wolfe's death. He quotes from General Mahon's life of Brigadier General James Murray that West asked Murray to allow his portrait to be included, but Murray replied "I was not there (i.e. near Wolfe). I was commanding the troops in my charge." Again Dr Webster says that Doughty in his *Siege of Quebec* "states that John Hale, of the 47th Regiment, was asked to pay West £100 for the privilege of forming one of the group, but he declined, with the result that he was omitted." If it is really a representation of Robert Adair, then he must have been party to such an arrangement. It may be merely a coincidence and of no real significance, but it is certainly of interest that West painted an altar-piece, as he had done elsewhere, for the chapel of Chelsea Hospital, where Robert Adair was surgeon from 1773 on.<sup>3</sup>

I have been making notes upon the careers of these two Adairs, Robert and John, for some years and it seemed that they might be interesting enough to put down on paper, although by so doing I know little will be added to the history of medicine.

## 2

Unfortunately we do not know nearly as much about John as about Robert Adair. The date and place of his birth are unknown but Colonel Johnston writes that he was appointed on 30 April, 1746, Master Surgeon with Major General James Sinclair. It was intended that Sinclair should command a force of six thousand men against Quebec, "but the expedition was delayed too long to permit of its sailing that season", so it was decided to attack the coast of Brittany "to surprise Port L'Orient, where the French East India Company had its dépôt of stores and ships." Sinclair laid siege to the port but this was unsuccessful although he did succeed in destroying the forts in Quiberon Bay and then returned to England.<sup>7</sup>

John Adair was placed on half pay before 1750 and his next appointment was that of "Surgeon to the Staff on Braddock's Expedition (Fort Duquesne)", dated 24 September, 1754. His commission<sup>8</sup> was granted on the



same day as those to Sir James Napier and John Cherrington, but Napier's reads, "Director to the Hospital" We all know the fate of Braddock's Expedition and how he was mortally wounded by the French and Indians when still about seven miles from Fort Duquesne, now Pittsburgh Although I have been through Major General Braddock's Orderly Books, published at Cumberland, Maryland in 1880, I can find no mention of John Adair "Doctor Napper, Director of the 2<sup>d</sup> Hospital" is named, this probably refers to James Napier<sup>9</sup> especially as the two names are sometimes referred to as one (See *Dictionary of National Biography*)

In the Army List for 1755, John Adair is named as "Surgeon of hospitals in North America" Then in the War Office Papers are entries for John Adair as "Master Surgeon in hospitals in North America" from 25 December, 1756—24 June, 1757, and again 25 December, 1757—24 June, 1758, under Loudoun John Campbell, fourth Earl of Loudoun,<sup>10</sup> was appointed Commander-in-Chief of the British Forces in North America in March 1756, but was recalled to England a year or so later as at Halifax where he wasted his time, he was "unable to decide on a definite course of action" in order to lay siege to Louisbourg A Philadelphian is responsible for an amusing quip about Loudoun, that he "was like Saint George upon the sign posts, always on horseback but never advancing" General Amherst succeeded Loudoun and was in command of the army at the siege and capture of Louisbourg, the French stronghold on Cape Breton, in June and July, 1758 John Adair acted as Director of Hospitals there, "though without a Commission as such"<sup>11</sup> I could find no mention of John Adair in John Stewart McLennan's monumental history *Louisbourg from its Foundation to its Fall, 1713-1758*, published in London in 1918

John Adair also acted in the same capacity in Wolfe's expedition against Quebec Monckton was second in command and it is probable that John Adair went there with him You all know the story of how the troops scaled the cliffs above Quebec during the night of 12-13 September,

1759, at a spot now known as Wolfe's Cove, and engaged the French under Montcalm on the Plains of Abraham. Wolfe was mortally wounded, but said, "I die contented." Monckton was also wounded but he recovered.

We know from a letter from Monckton (see below) that John Adair acted as Director of Hospitals with the expedition against Montreal a year after the fall of Quebec, and it is probable he served there under James Murray who had been one of Wolfe's three brigadiers. British troops from Quebec under Murray, from New York under Amherst, and from Crown Point under Colonel William Haviland all converged on Montreal, and on 13 September, 1760, De Vaudreuil and his French troops—all that remained in the country—laid down their arms.

On 2 November, 1761, John Adair was commissioned by General Amherst, Director of Hospitals with Major-General Monckton's expedition to Martinique, the naval force being under the command of Rodney. The expedition was successful, and on 4 February, 1762, Fort Royal capitulated after some sharp fighting.

Monckton returned to New York and on 14 August, 1762, we find him writing to "The Right Honorable the Secretary at War" (Charles Townshend) recommending, as follows, that John Adair be put on half-pay as Director of Hospitals for he had been struck off on his arrival in New York in June.<sup>12</sup>

New York August  
ye 14th 1762

Sir,

I am sorry to be so troublesome to you. But where Merit is in Question, as in this case, I am convinc'd you will be good enough to Excuse it.

Mr Adair Surgeon of the Hospital, who has been here the whole War, with great Credit, both as to Diligence, & Abilitys in his Profession, & who has served as Director, though without a Commission as such—On the Expeditions against Louisbough, Quebec, & Montreal, and with one

for the time, With the Army under my Command,  
 Employ'd against Martinique—Is hopefull Sir,  
 that he has merited to be put on the Half Pay  
 List as Director, As he thinks nothing but his at-  
 tendance here on his Duty, has prevented him  
 from being a Director long before this — Many  
 younger than himself in his Branch having been  
 Prefer'd to it

I could not Refuse him, Sir, this Testimony  
 of his Merit, having been well acquainted with  
 his Service —

I have the Honour to be,  
 with Great Esteem

Sir

Your most obedient

The Right Honble  
 the Secretary at War

Huml Servt  
 Robt Monckton

This request was repeated in Monckton's letter of 27 October, but I cannot discover if it was granted John Adair was shown on half-pay for the last time in the Army List of 1799 but as was often the case in those days an officer's name continued to appear for some years after his death Mr A S White, Deputy Librarian of the War Office kindly writes to me that in the *Gentleman's Magazine* for 1794 under "Deaths" and with the date of 9 September, 1794, appears the following notice "At his lodgings in Charles Street, St James's Square, John Adair, formerly Surgeon General to the Army in America under General Wolfe"

### 3

Robert Adair was apparently born in Ireland about 1710 or 1716, but the exact date and his parentage, except that he came from the "middle rank of life," remain unknown The chief sources of information are found in Col Johnston's book and in a curious anonymous tract, *Memoirs of the Life of Robert Adair, Esq*, written in the high falutin style of the period, published in London in 1790, on the title-page of which is the well-known quota-

tion from Ovid (*Sic*), "omnia vincit amor" Another account is found in the first six pages of *The Lounger's Common-Place Book*,<sup>13</sup> published anonymously, the author of which is known to have been Dr Jeremiah Whitaker Newman (1759-1839) From the similarity of this to the tract and the identity of some of the phrases, it is safe to assume, as Pinkerton<sup>14</sup> did, that they were both written by the same hand Adair was known in London as the "Fortunate Irishman", an apt description as will soon be seen He was a person of pleasing address and had "no enemies but his passions" and is said to have been the "favourite of the fair" and to have "played the Devil with the women"! He was a pupil to a medical man in Ireland but fell in love with his master's wife, and, be it said, she fell in love with him On account of this "early amour" he had to decamp from Dublin in haste and sought his fortune elsewhere, never to return

There are now certain discrepancies in the accounts of events in the life of this adventurer He became a Member of the Company of Barber Surgeons in 1738, a fact noted by Stephen Paget in his life of John Hunter The present Master of the Company in a letter to me assures me that he was a Member It is also certain<sup>15</sup> that he was appointed Surgeon to the Forces in Flanders, 20 March, 1742, afterwards on half pay, then Chief Surgeon to the Hospitals and Inspector General of the Regimental Infirmaries, 3 March, 1756 The facts are irrefutable but Newman would have things happen in a far more romantic way He says that Adair set out from Dublin for London to seek his fortune as a surgeon there His first stroke of luck came soon after he landed at Holyhead but I cannot do better than quote from the Memoirs<sup>16</sup>

for on his road from that place to London, the carriage of a lady,<sup>17</sup> whose equipage and attendants were splendid, being overturned, and a servant enquiring for a surgeon, he offered his services, which were accepted, bled her, and recommended an application to a slight injury on her hip, in short, by his tender assiduity he made such

an impression on his patient, that she requested that he would accompany her in her carriage to town

She proved to be a woman of fashion, at that time well known in the polite world, but on the wrong side of nine-and-thirty, and had been a famous demi-mop and free thinker

When he took leave of her in town, she put a hundred pound bank-note into his hand, gave him a general and pressing invitation to her house, made a point of introducing him to all companies that could forward his professional advancement, left him a handsome legacy, and, what decided the fate of his life, it was at her house he first beheld Lady Caroline Keppel (*sic*), daughter of the Earl of Albemarle

The emotions of this amiable woman, at first seeing Mr Adair, are said to have been singular, sudden, and violent, so much so as to have been noticed by the company present, and to have occasioned her soon after quitting the room

Our hero was not a likely person to suffer a behaviour so flattering to the feelings of a young man to escape his penetrating eye, more especially in a woman whose rank and family would add splendor and dignity to his future life

We may easily believe that he neglected no means that love and opportunity could give him, to improve so sudden and (if I may be allowed the expression) so extraordinary a predilection in his favour

Lady Caroline Keppel was the daughter of William Anne, Second Earl of Albemarle, and his wife, Lady Anne Lennox, daughter of Charles, first Duke of Richmond. Figure 4 is from a photogravure of her portrait painted by Sir Joshua Reynolds<sup>18</sup>. She was born in 1737 but it is not recorded when she and Adam met. It is known that she sat for Reynolds in 1755 and 1757. Lady Caroline's family



Figure 4

Photograph of Painting by Sir Joshua Reynolds of  
Lady Caroline Keppel

(From Graves and Cronin *A History of the Works of Sir Joshua Reynolds*  
London 1899 1901 )

naturally did not look with favour upon her falling in love with this almost penniless, though handsome, young Irish man and sought by all manner of means to distract her attention into other channels <sup>19</sup>

Amusements, a long journey, an advantageous offer, and other common modes of shaking off what was considered by the family as an improper match, were alternately tried, but in vain, the health of Lady Caroline was evidently impaired, and the family at last confessed, with a good sense that reflects honour on their understandings as well as their hearts, that it was possible to prevent, but never to dissolve an attachment, and that marriage was the honourable and indeed the only alternative, that could secure her happiness and life

W F Prideaux says<sup>20</sup> that it was during one of these periods of temporary separation, in 1753 or 1754,<sup>21</sup> (Pinker ton says when she had been sent to Bath—*loc cit*), that Lady Caroline wrote the words of the song *Robin Adair* and set them to the old Irish tune of *Eileen Aroon*<sup>22</sup> which means "Ellen the secret treasure of my heart", a song of the fourteenth century She had learnt this tune from her lover Robert Adair

Here are the words

*What's this dull town to me?  
 Robin's not near,  
 He whom I wished to see,  
 Wish for to hear  
 Where's all the joy and mirth,  
 Made life a Heaven on earth?  
 Oh! they're all fled with thee,  
 Robin Adair*

*What made the assembly shine?  
 Robin Adair!  
 What made the ball so fine?  
 Robin was there!*

*What when the play was o'er  
 What made my heart so sore?  
 Oh, it was parting with  
 Robin Adair!*

*But now thou art far from me  
 Robin Adair!*

*But now I never see  
 Robin Adair!*

*Yet him I loved so well  
 Still in my heart shall dwell,  
 Oh, can I ne'er forget  
 Robin Adair!*

It is interesting in looking over the files of that mine of information, *Notes and Queries*, to see how often this plaintive song or ballad has been discussed. It must be distinguished from the "rollicking sporting song commemorating the Kilruddery Hunt"<sup>20</sup> in which a "Squire Adair" is mentioned. W. F. Prideaux wrote in 1896 that "those who have a leaning to the sentimental side of history" accept the version that the surgeon Robert Adair was the hero of the song and this was the opinion of William Pinkerton in 1864. This is the view of Col. Johnston also who has accepted that given in Grove's *Dictionary of Music*. It is curious, however, that neither the notice of Adair's death in the *Gentleman's Magazine* or Newman in his *Memoirs* make any mention of the song.

On the plaintive song, *Eileen Aroon*, several parodies have apparently been written, one a drinking song entitled *Johnny Adair of Kiltiernan His Welcome to Puckstown*, of which I quote one verse <sup>14</sup>

*I could drink wine with you,  
 Johnny Adair  
 O, I could drink wine with you,  
 Johnny Adair  
 I could drink beer with you,  
 Aye, rum and brandy too,  
 O, I could get drunk with you,  
 Johnny Adair*



Robert Adair and Lady Caroline Keppel were married on 22 February, 1759<sup>23</sup> As the author of the *Memoirs* observes "this auspicious union was the seal to Mr Adair's good fortune" The statement that "he was soon appointed Inspector General of all Military Hospitals, with an income adequate to the importance and responsibility of the office"<sup>24</sup> must refer to his appointment as "Chief Surgeon to the Hospital of the Forces in Great Britain and Inspector of the Regimental Infirmaries, 3 March, 1756, and 27 October, 1760", which Col Johnston quotes from official records It is said he became the personal favourite of his sovereign George III and the friend of the King's brothers one of whom, William Henry Duke of Gloucester (1743-1805), the King's favourite, Adair, in the words of the author of the *Memoirs*, "apparently rescued from the jaws of death" on two occasions

Adair's practice became very extensive and brought him a large income "while the elegance of his manners, his inoffensive deportment, and characteristic gentleness, secured him the esteem and affection of the sick and infirm of all ranks" New man compares his philanthropy and kindly bearing towards his inferiors with the "harsh severity" and "rugged peevishness" of some of his contemporaries, naming Messrs Pott and Else Adair was evidently frugal in spending public money and instead of counting the danger of creating a precedent by sanctioning some new expenditures of government funds, he would rather assist those below him in the Army by giving from his own purse The *Gentleman's Magazine* states that "a man of more honour, and more worth, has seldom lived"<sup>25</sup>

Lady Caroline set out for Portugal to nurse her sister who was ill with consumption With her was her brother Captain Keppel, (Augustus Viscount Keppel) who had also been sent to America to cooperate with General Braddock in 1754, and later became an Admiral The sister died in 1768, and Lady Caroline contracted the same disease and died in 1769<sup>26</sup> She had borne her husband three children, one of whom, Robert, lived from 1763 to 1855 He became a firm friend of Charles James Fox He sat in

parliament, and was sent abroad on several important diplomatic missions for which he was rewarded in 1831 by being made Sir Robert Adair, G C B

Amongst some papers found after Lady Caroline's death was a rather strange request that her husband should wear mourning for her for the rest of his life, "if not very disagreeable to him", but I should quote from the *Memours*, etc, pp 21 22

Trifles, however unimportant to others, frequently tell our love, and this minute request of Lady Caroline's, Mr Adair religiously observed, except on two occasions in the year, the birthday of a King to whom he was personally attached, and that of his royal consort

Adair did not marry again, although it is written that "A Countess, more remarkable for her wealth than her prudence, and the buxom widow of a Norfolk Baronet, are said to have given him *very intelligible hints* on the subject" But to quote from the *Memours*, p 28, again

His acknowledged tenderness and generosity sometimes occasioned his being duped by the selfish views of artful females one of this description, detestable for having ruined some years since two unhappy brothers is said to have manoeuvred with the feelings of our hero, and to have raised heavy contributions on his pocket

In 1773 John Ranby, Surgeon to the Royal Hospital at Chelsea, died, he had succeeded Cheselden in 1752 He had been a prime mover in separating the surgeons from the barbers and, through his influence as principal Sergeant-Surgeon to George II, an Act of Parliament had been passed in 1745 establishing a Corporation consisting of a Master, Governors, and Commonalty of the Art and Science of Surgery in London, the forerunner of the Royal College of Surgeons of England He became the first Master Adair was angling at Richmond when the news of Ranby's death was brought to him, but drove instantly to see the King at Windsor, in his fisherman's dress and without his

"sword and bag" When he was announced, the King said "What, Adair, let him come in directly, he knows I am always glad to see him in any dress" The "fortunate Irishman" expressed his "wish to be amongst his favourite veterans" at Chelsea and the King replied, "I promised it long ago to Middleton but, you know, Adair, I cannot refuse you"<sup>26</sup> On leaving the King, Adair met Robert Middleton on the road driving in haste to seek the position at Chelsea that had been promised him While Adair was Surgeon there, that eccentric character, Messenger Monsey, the friend of Sir Robert Walpole, Lord Chesterfield, and Garrick, was Physician to Chelsea Hospital

The Royal Hospital at Chelsea is sometimes referred to as Chelsea College, and the reason for this is found in an interesting anecdotal book by George Robert Gleig entitled *Chelsea Hospital, and its Traditions* (London, 1839) Gleig was Chaplain to the Hospital and later Chaplain General to the forces King James's College at Chelsea was incorporated in 1610 for the study of theology, but did not thrive owing partly to lack of funds, and it fell into the hands of the Duke of Hamilton Charles II asked that it be presented to the Royal Society and the Duke acceded to his request, but the College was too far from London to be of use The King purchased the building and grounds in 1681 and handed the lands over to his favourite Nell Gwyn, and there she lived in a cottage It may have been the idea, of Charles II himself to found a hospital for "decayed and emerited" soldiers, but tradition has it that "pretty witty Nell", moved by the poverty and distress of a soldier who had fought in the civil wars, conceived the idea of such a hospital or home (The Hôtel Royal des Invalides had been founded at Paris in 1670) Nell ceded her rights and gave the lands back to the King and Chelsea Hospital was founded in 1682 In return she received a mansion in Pall Mall built for her by Charles Evelyn was consulted about the Hospital—"what method to cast it in, as to the government", as he put it Sir Christopher Wren was the architect of the magnificent

buildings, which were slowly erected and finished under William and Mary in 1690

It was whilst Adair was Surgeon to Chelsea Hospital, in 1777, that he was sent abroad in haste with Dr Richard Jebb to attend William Henry Duke of Gloucester, who had been banished from the court on account of his secret marriage. Jebb was then physician to St George's Hospital and had delivered the Harveian Oration at the Royal College of Physicians in 1774. The Duke recovered quickly. The doctors brought professional skill but also conveyed a conciliatory message from the King which no doubt was better than all their prescriptions! They were richly awarded on their return and Jebb accepted a baronetcy, an honour which Adair, however, "with equal propriety and good sense, begged leave to decline"

Newman cannot refrain from saying of Adair "Nor was the solace of female society wanting to soothe his private hours", and mentions

the little Nightingale, with lips not only made to speak, the lively relict of a military declaimer, and the widow, or deserted wife, of a luxuriant branch of the Fox family, and a lady, who, from the bounties of nature, has not the least occasion for the artificial embellishment of cork, alternately co-operated to make him happy<sup>27</sup>

Adair seems to have been less attracted by mere beauty as he grew old but sought the company of those who were "rich in literature", and "good sense", qualities which attracted, delighted and instructed him. Amongst these was the wife of a Mr Hesse suddenly bereaved of her husband

But Adair, the comfort of the friendless, flew on the wings of mercy and pity, snatched her from the afflicting scene, sheltered her under the hospitable roof of his retirement at Chelsea, and applied every consolation that tranquility and the lenient hand of friendship could bestow, he was in every sense the good Samaritan, the father, and the friend<sup>28</sup>

Adan was made Surgeon-General to His Majesty's Forces, in 1768, a position worth from £800 to £3-£1000 a year, and died 16 March, 1790, at the age of nearly eighty, or, as Newman says, in his seventy-fourth year. He was buried beside his wife, according to the account of Lady Caroline, but I have not been able to discover where that was.

The *Gentleman's Magazine*,<sup>29</sup> contains some verses entitled "On the Death of Robert Adan, Esq, late Surgeon-General", by J. Crane, M.D. William Pinkerton's amusing comment on them was that he hoped that the doctor "was a much better physician than a poet."

The portrait of Robert Adan was painted by (Francis) Lemuel Abbott (1760-1803), the son of a Leicester clergyman. He settled in London in 1780, so that some time between this date and 1790 he executed the portrait. Adan was, therefore, somewhere between sixty-four and seventy-four years of age. The article on Abbott in the *Dictionary of National Biography* states that "his male portraits were perfect in their likenesses." A mezzotint by John Jones (1745-1811) after this portrait was published by him in 1791. Figure 2 is a reproduction made from a copy of the mezzotint in the Dr. Thomas Addis Emmet Collection at the New York Public Library and, quite in keeping with the usual story, someone, most probably Dr. Emmet, has written in pencil below the imprint "Wolf's Surgeon at Quebec."

Robert Adan's library was sold in London in 1791, by Benjamin White and Son. The Bodleian Library possesses a copy of the sale catalogue entitled *A Catalogue of a large and valuable Collection of Books in all Languages, and in every branch of Literature Including the Libraries of the following Gentlemen deceased Edmund Bott, Esq of Christ Church Hampshire, Robert Adan, Esq Inspector General of all His Majesty's Military Hospitals, etc And the Books in Natural History of John Blake, Esq of Parliament Street* ([IV] + 328 pp). Below this rather formidable title is printed a select list of the books, but it is striking today to see that Harvey's *De Generatione*

*Animalium*, 1680, is omitted, though inside on p 190 it is priced at one shilling—think of that and how times have changed! Robert Adair evidently possessed a good medical library of some hundreds of items

In trying to clear up a few facts about Robert and John Adair, I have, purposely, refrained from mentioning two other men of the same family name who came out to the New World. James Adair emigrated to America in 1735 and was a trader for forty years with the Indians. He thought they came from the lost ten tribes, and wrote a *History of the American Indians*, London, 1775. James Makittrick (1728-1802), who later assumed the name Adair, was an Edinburgh graduate who practised in Antigua and wrote on yellow fever and against the abolition of the slave trade. He returned to England, set up in various places, including Bath, and was, to say the least, a colourful figure, especially in his controversial pamphlets against Philip Thicknesse.

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- 5 *British Museum Catalogue of Engraved Portraits*, London, 1908-1925, v 8
- 6 J. Clarence Webster, *Wolfe and the Artists, a Study of his Portraiture*, Toronto, 1930, p 69
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- 10 *Dictionary of National Biography*, article on John Campbell, fourth Earl of Loudoun
- 11 See Monckton's letter quoted later
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- 29 *Gentleman's Magazine*, 1790, lxxvii, pp 354 - 355



## POSTGRADUATE MEDICAL EDUCATION — WITH ESPECIAL REFERENCE TO PRESENT MATERNAL MORTALITY RATES IN THE UNITED STATES

Throughout the past ninety years The New York Academy of Medicine has been actively interested in the development of opportunities for the continued education of the practicing physician. So many and complex problems were encountered in this field that the Academy in 1924 created a standing Committee on Medical Education. It has become increasingly manifest to members of this Committee that the abundant opportunities of this City for postgraduate clinical instruction are not fully utilized, especially in the obstetrical field. This need, be it said, is no less appreciated by the general practitioner than by those concerned with medical education, in fact, many educators believe that the deficiency in opportunity for adequate instruction is the chief obstacle faced by practitioners eager to obtain instruction.

This problem has induced us to review recent texts dealing authoritatively with the present status of obstetrical practice in this Country. A few extracts from these will be quoted to demonstrate the immediate need for development of postgraduate short courses in this field. The position of the United States in comparison with other nations may be judged by the following summarization in a recent Bulletin of the United States Department of Labor.\*

"The official figure of the United States, which in the last few years has exceeded that of every country except Scotland, remains high no matter what method of assignment is used. Even if the method of the country assigning the smallest proportion of deaths to the puerperal state were in use in the United States, the United States figure would still exceed that of all the countries except Australia, Canada, Chile, and Scotland. Rates for the United States estimated in accordance with the assignment procedure of

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\* Comparability of Maternal Mortality Rates in the United States and Certain Foreign Countries (United States Department of Labor, Publication No. 229, 1935)



the respective countries are in every instance except Scotland in excess of and are in five instances more than double the official rates of the countries themselves. No matter what method of procedure is used the United States retains an exceedingly high rate as compared with other countries."

In seeking an analysis of this situation, we have turned to another report issued by the same Federal Department.<sup>†</sup> A few extracts from this careful study of Maternal Mortality in fifteen states may prove enlightening.

### *Maternal Care*

"Although this study covered but 15 States, they represent a fair cross section of the country, and therefore it is probably fair to assume that the findings in this section are applicable to the country as a whole.

"It is discouraging to find that of the women on whom a report as to prenatal care could be obtained and who could reasonably have been expected to have such care, 54 per cent had had no prenatal examination by a physician. In only 1 per cent was the care given up to the standard that it is the right of every pregnant patient to have and to demand.

"For the deaths of the women who had had no prenatal examination the attending physician could hardly be held responsible, for he was not consulted until an emergency had arisen. Gross ignorance, carelessness, and sociological and economic problems all had a share in this responsibility. However, in those cases in which the physician was consulted he was responsible for providing adequate maternal care, and in many of these cases physicians failed in their responsibility, for half the women who did consult a physician had poor prenatal care.

"Delivery care, though as important as prenatal care, was more difficult to evaluate but certain facts were noted. For more than half the women who died in hospitals after reaching the last trimester, hospitalization was an emergency measure.

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<sup>†</sup> Maternal Morbidity in Fifteen States (United States Department of Labor, Children's Bureau Publication No. 223, 1934)

"Eighty three per cent of the women were attended by physicians, internes, or medical students, 11 per cent by midwives, 4 per cent by non-medical attendants, 2 per cent of the women had no attendant at the delivery or at the death if the patient died undelivered. Figures given in the report would indicate that, though the midwives played a part in the mortality, they could not have been responsible for any large proportion of the deaths because they attended a relatively small percentage of the cases.

"In 48 per cent of the cases the physicians described their technique, as they remembered it, in such a way that it was classified as aseptic, but obviously this is not a sure way of determining how good this technique was. The point to be noted is that the physicians themselves admitted it was unsatisfactory in more than 50 per cent of the cases.

"The almost total lack of adequate prenatal care and the relative infrequency of any prenatal care were outstanding. Besides permitting the unchecked development of unfavorable factors during pregnancy, this situation led to delivery care that was unsatisfactory because given without previous knowledge of the case and frequently in circumstances that necessitated emergency hospitalization."

### *Operations*

"In this series of cases all the women died (and many of the babies), and, therefore, it is a record of failure. One cannot say that the operative procedures followed in many cases caused the deaths, but analysis of these procedures leads to many criticisms of the management of these cases.

"The physicians who delivered these cases cannot be blamed in all cases for the results obtained, for in 43 per cent of the operative deliveries they had not seen the women before labor or before the acute emergency had occurred. Under these circumstances it is a well recognized fact that the operation of election is not always possible, the physician many times is forced to do something which he appreciates may not be the best but which, at the time, seems justifiable. In a study of this type the

physician's ability to do well the operation he has chosen can be evaluated only by the results, which show that many of the operations either were badly chosen or were poorly done. In nearly 40 per cent of these operative deliveries it was admitted by the physicians that their technique was at least unsatisfactory with regard to asepsis. It is therefore not to be wondered at that 26 per cent of the deaths following forceps deliveries and 19 per cent of the deaths following versions were due to sepsis. An operative delivery is a surgical procedure and should not be undertaken by physicians untrained in surgical technique. It is evident that many of these physicians did not have such training.

### *Abortions*

"That one quarter of all the maternal deaths in this study followed some type of abortion is probably the most outstanding finding of the study. The further finding that three quarters of the deaths following abortion were due to puerperal septicemia is equally significant.

### *Puerperal Septicemia*

"That 40 per cent of all the deaths in this study were of women who had such obvious and unmistakable signs of sepsis that there could be no question how they should be classified shows clearly the serious condition presented by this cause of maternal death.

"No matter how the figures are analyzed, it is clear that the loss of life from sepsis is enormous. That in the last trimester of pregnancy 1,529 women of this series died of sepsis, 94 per cent of whom had a spontaneous onset of labor and 65 per cent a spontaneous termination of labor, is nothing short of appalling.

"What is the reason for the existence of this condition? It is due to lack of proper teaching of obstetrics in some of the medical schools, lack of opportunity to deliver a sufficient number of normal cases, and almost total lack of experience in the simplest obstetric operating, or else it is due to the willful disregard by careless physicians of the fundamentals of asepsis.

*Toxemias of Pregnancy*

"The chief method of attack against the severe toxemias of pregnancy is conceded to be then early detection and control. For this it is necessary to have continuous intelligent medical supervision of the prospective mother from early in pregnancy, early recognition of untoward symptoms, prompt and judicious treatment of symptoms as they appear during pregnancy as well as during and after actual delivery of the patient, and the cooperation of the patient.

"Probably it is now generally conceded that radical treatment in eclampsia is never indicated except in the best environment and with proper anesthetic. The dire results of teaching radical treatment for eclampsia were manifest—almost universal resort to immediate operative interference in all kinds of cases and by all kinds of practitioners.

"Few of these women were treated along the conservative lines now accepted—with fluids, glucose, magnesium sulphate, and morphine or other sedative and induction of labor. There can be no question that failure to institute prompt treatment and the injudicious treatment they did receive contributed to many of the deaths. It is evident, therefore, that some safe, conservative treatment for eclampsia should be agreed upon and that knowledge of it should be widely disseminated."

*Puerperal Hemorrhage*

"If the onset of hemorrhage in placenta previa were accompanied by pain, patients would apply for treatment sooner and would not be content with inactivity on the part of the physician. Of 234 cases in which warning bleeding occurred, it was ignored by the patient or by the physician in 216, and in more than half these cases it was the physician who was responsible for the delay."

The report from which these quotations have just been made concludes with the carefully considered and comprehensive recommendations of the Advisory Committee. From these we extract the following which relate to the need for greater opportunities for postgraduate instruction.

(c) "In order that physicians in general may have a better understanding of the fundamentals of obstetric care

- 1 There should be larger and better facilities for clinical training in obstetrics
- 2 Undergraduate students should have a much wider contact with obstetric patients
- 3 The State medical societies, the medical schools, and State departments of health should provide or arrange for postgraduate teaching in the various counties in order to keep the local practitioner in touch with the best obstetric thought and practice "

It becomes more and more apparent as one studies the problem that, whereas lack of adequate prenatal care, economic and other sociological factors influence the maternal mortality rates in the United States, a most ponderable factor is the lack of opportunity for the general practitioner to receive training in obstetrics

When one studies current statistical reports of maternal mortality in the United States and the analyses of these reports by the best informed men in this field, it is not to be wondered that leading men engaged in practice in this special field in this State and City are so insistent upon the development of opportunities for general practitioners to obtain the fundamental training necessary to enable them to recognize and cope with the chief obstetrical emergencies presented in their practice. In this City, since the Living-In Hospital has been absorbed by the New York Hospital for undergraduate teaching, there does not appear to be any very large obstetrical service available for postgraduate clinical instruction in obstetrics. At any rate the existing resources are not fully exploited



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NOVEMBER 19

*Drugs in the treatment of heart disease*

The actions and uses of the various medicinal remedies employed as therapeutic agents will be discussed. Consideration will be given to the indications for using particular drugs, as well as to their limitations and toxic effects. Drug therapy will be related to the general management of the cardiac patient.

ROBERT L. LEVY, *Professor of Clinical Medicine, College of Physicians and Surgeons, Columbia University*

NOVEMBER 26

*Anterior pituitary—its hormones relative to diagnosis and therapy*

Recent biological investigation and chemical studies upon the hypophysis have strikingly confirmed previously accepted clinical syndromes. These newer concepts and their relationship to diagnostic understanding of anterior lobe functions and clinical pictures are revealing and open up further possibilities for therapy. Older ideas on therapy will be discussed in relation to the new biological products and the success and failures of these will be noted. Functional pituitary disturbances in relation to the anterior lobe hormones are of especial importance and transcend such characteristic pictures as neoplasms, acromegaly, etc. Their symptomatology and treatment will be discussed.

IRVING H. PARDEE, *Chief of Service, Neurological Institute*

## DECEMBER 3

*Newer laboratory aids and their clinical value*

The appraisal of tests which can be done by the average physician, including some of the newer chemical and serological determinations

FRANKLIN M HANGER, *Associate Professor of Medicine, College of Physicians and Surgeons, Columbia University*

## DECEMBER 10

*The problem of the jaundiced patient*

The preoperative preparation, the problems of operation and the post-operative care will be touched upon. The unreliability of the liver function tests will be reviewed. The problem of improving the liver cells prior to operation will be discussed. The postoperative complications and their method of control will be reviewed.

I S RAVDIN, *Harrison Professor of Surgery, University of Pennsylvania*

## DECEMBER 17

*Recent advances in the diagnosis and treatment of peripheral vascular diseases*

Newer developments in the classification, diagnosis and treatment of various conditions affecting primarily the peripheral blood vessels will be discussed, with particular reference to publications during the past few years. The newer therapeutic procedures will be described and summarized.

EUGENE M LANDIS, *Assistant Professor of Medicine, University of Pennsylvania*

## 1938

## JANUARY 7

*Treatment of pneumonia*

RUFUS COLF

JANUARY 14

*Bulkley Lecture Cancer of the gastrointestinal tract*

Carcinoma of the gastrointestinal tract, if seen early and operated on radically, offers a favorable prognosis. The larger percentage of such lesions, however, reach a surgeon when the condition has become inoperable, due to fixation to surrounding structures or extensive metastatic involvement. Attention will be called to early diagnostic signs and symptoms, followed by a presentation of the most modern surgical procedures.

CARL EGGERS, *Professor of Clinical Surgery, College of Physicians and Surgeons, Columbia University*

JANUARY 21

*Recent advances in common diseases of children*

Consideration of a certain number of those diseases in which the diagnosis or the therapy or both have been modified as a result of recent contributions.

SAMUEL Z. LEVINE, *Professor of Pediatrics, Cornell University Medical College*

JANUARY 28

*Endocrine therapy in gynecology*

The various agents available for endocrine therapy, particularly the glandular products, but with mention of radiation and surgery where these agents influence the endocrine status of the pelvic organs, the diagnostic measures which should be carried out, to exclude the conditions for which endocrine therapy is contraindicated, and to differentiate between the types of endocrine disorders, the actual conditions for which endocrine therapy may be used, with an outline of the treatment to be instituted.

HOWARD C. TAYLOR, JR., *Associate Professor of Gynecology and Obstetrics, New York University Medical School*

## FEBRUARY 4

*What can orthopedic surgery do for the arthritic cripple?*

The author will present the thesis that there is an important place for reconstructive surgery in the treatment of many patients apparently hopelessly crippled as a result of chronic arthritis. He will discuss the various operative procedures as employed in a series of patients treated during the last fifteen years. He will discuss the underlying pathological condition which needs to be corrected and present the indications and contraindications for surgery. There should be a wider understanding of the possibilities of obtaining relief from surgery in some of these cases.

PHILIP D WILSON, *Surgeon-in-Chief, Hospital for Ruptured and Crippled*

## FEBRUARY 11

*A consideration of nervous and mental disease in general practice*

FOSTER KENNEDY, *Director of Neurological Department, Bellevue Hospital*

## FEBRUARY 18

*Convalescent measles and scarlet fever serums, their value in prophylaxis and therapy*

A short historic resumé of the prophylactic and therapeutic use of convalescent measles and scarlet fever serums, the manner of securing and preparing the serums, particularly the safeguards to insure potent and safe serums. Discussion of results to prevent an attack of measles or to attenuate the attack in children exposed to this disease, the importance of preventing this disease in children under five years of age, the treatment of measles in the prodromal period, and the prevention and treatment of scarlet fever.

WILLIAM THALHIMER, *Director, Manhattan Convalescent Serum Laboratory*

## FEBRUARY 25

*Lobectomy and pneumonectomy*

A discussion of the indications for resection of a lobe or one entire lung for infections and neoplasms. Special reference will be made to the use of radical surgery in the treatment of bronchiectasis, chronic lung abscess, benign and malignant tumors of the lung.

EDWARD D CHURCHILL, *John Homans Professor of Surgery, Harvard Medical School*

MARCH 4

*The evaluation of recent therapeutic procedures*

This lecture will consist in a resume of the various newly introduced procedures in the field of general therapeutics, including pharmacology, diet therapy, physiotherapy and hydrotherapy

MILTON A. BRIDGES, *Assistant Professor of Clinical Medicine, New York Post-Graduate Medical School, Columbia University*

MARCH 11

*Various types of colitis, with particular reference to ulcerative colitis*

Discussion of various types of colitis, differentiating the infectious and non-infectious. The causative agent and essential pathology of each type will be brought out sufficiently to provide a basis for treatment

THOMAS T. MACKIE, *Research Associate, Cornell University Medical College*

MARCH 18

*The modern treatment of diabetes mellitus*

Review of recent advances in our knowledge of diabetes. Principles of treatment. Application of this knowledge in the treatment of the diabetic patient. Present status of carbohydrates, protein and fat in the diabetic diet. The use of insulin and protamine insulin. Management of the ambulatory diabetic, the operative diabetic, diabetes with acute infections and diabetic acidosis.

JAMES RALPH SCOTT, *Chairman, New York Diabetes Association*

MARCH 26

*The recognition and management of common skin diseases in general practice*

The logical domain of the general practitioner in relation to the dermatologist will be considered. The general practitioner's management of acne vulgaris and of common eczematous dermatoses, including eczematous "ringworm," will be discussed in detail. Special emphasis will be placed on the rationale of therapeutic procedures, as viewed in the light of newer concepts of etiology and pathogenesis. The entire subject will be presented on a rigidly practical basis with the object of demonstrating those modern and accepted therapeutic measures which can actually be applied in general practice.

MARION B. SULZBERGER, *Assistant Professor of Clinical Dermatology and Syphilology, New York Post-Graduate Medical School, Columbia University*

APRIL 1

*Rheumatic fever*

A review of the current concepts of the nature of the disease, including certain indications in therapy.

HOMER F. SWIFT, *Member of The Rockefeller Institute*

APRIL 8

*The physiology of the liver metabolism as a basis for liver function tests and diet treatment*

Discussion of the normal function of the liver in regard to the intermediary metabolism. Critical evaluation of the liver function tests for diagnosis. Suggestions for diet treatment of liver diseases.

S. J. THANNHAUSER, *Associate Professor, Tufts Medical School*

APRIL 15

*The treatment of hemolytic streptococcus infections*

A discussion of the treatment with particular reference to drugs and serums such as prontosil, erysipelas antitoxin, scarlet fever antitoxin, convalescent serum, etc.

REUBEN OTTENBERG, *Assistant Professor of Clinical Medicine, College of Physicians and Surgeons, Columbia University*



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Lecturer, Professor, Fordham University

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RAYMOND PEARL, PH.D.

Professor of Biology, Johns Hopkins University

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EDWARD LEWIS PEARL, PH.D.

Consulting Physicist

*The modern t*

*Review of recent and the Progress of Civilization—April 28*

of treatment Applied to AS MURRAY BUTLER  
diabetic patient Professor, Columbia University

in the diabetic diet *and the Memory of Man—May 26*

Management of the acute *and the Memory of Man—May 26*

diabetes with acute infection GREGORY COHN, M.D.  
Consulting Radiologist, Fifth Avenue Hospital

JAMES RALPH SCOTT, C.

# BULLETIN OF THE NEW YORK ACADEMY OF MEDICINE

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No 11

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## \*ADDRESS OF WELCOME TO THE TENTH ANNUAL GRADUATE FORTNIGHT

JAMES ALEXANDER MILLER, *President*

It is my pleasure and great privilege to welcome you to the Academy of Medicine on this the occasion of the tenth Graduate Fortnight. These Fortnights, presenting a series of lectures, clinics, and exhibits in connection with postgraduate education, have now demonstrated that they successfully fill a need which is felt by many members of the medical profession.

The Academy of Medicine is an extra-curriculum postgraduate medical institution and through its various activities, it attempts to help the physician do his work better and as a part of this program, the annual Graduate Fortnight was devised with the idea of systematizing various phases of medicine and surgery in an intensive way. Each year we have taken up some specific subject upon which to concentrate our attention and this year we are taking up the Disorders of the Urinary Tract from the medical and surgical points of view.

I think that we all realize as we go on in the practice of medicine that postgraduate training and education is essential. In fact, as soon as a physician or surgeon ceases to be a student—from that moment, usually, he begins to die professionally and finally withers away. It is in an effort to meet this need as recognized by studious members of the medical profession that this Fortnight has been arranged.

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\* Delivered November 1, 1937

It combines the point of view of both the internist and the surgeon and in that way it marks a very significant trend in medical progress—that is a closer correlation between these two branches of our profession. In the particular subject of this Fortnight, we have also a very important correlation with other fields of medicine as the affections of the urinary tract are associated in many cases with infectious diseases of various kinds which also affect other organs and as far as the kidney is concerned, many of the diseases which are of particular interest to internists are closely related to the degenerative diseases in general.

In this whole field, prevention as well as diagnosis and treatment is becoming increasingly important so that our studies must lead us also into the realm of preventive medicine.

The Fortnight, as you all know, is organized into three different categories—the lectures in the evenings, the clinics in the various hospitals to exemplify on the living patient the principles which have been set forth in the lectures, and then the exhibit this year we think particularly interesting and valuable. We invite your participation in them all.

Finally, we all appreciate the fact that however practical we may be in the application of our knowledge, we are absolutely dependent upon the basic fundamental principles on which that knowledge rests. It is, therefore, particularly fitting that in opening this series of lectures we should take up some of these problems from the standpoint of the scientist looking forward to a better understanding of the principles which underlie the conditions which we are to study.

It is consequently a peculiar pleasure to introduce to you the speakers upon this evening's opening program, Professor Alfred Newton Richards of the University of Pennsylvania and Dr. Donald D. Van Slyke of the staff of the Rockefeller Institute.

# THE NEPHROSES \*

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The subject assigned to me is very large. With the limited time at my disposal only a brief discussion of its major problems can be undertaken. Fortunately it has received lavish consideration in the past twenty years and the literature is replete with detailed information. While many differences of opinion still exist the fundamentals, upon which our present knowledge is based and which can be traced to the earliest publications on the subject, have suffered no radical change.

When first used, the term nephrosis applied to a group of renal affections in which the dominant pathological change was degeneration of the renal tubules. In this nomenclature were included not only the cases with a degenerative process in the tubules alone, but also those in which the lesion in the tubule was but a part of the diffuse process affecting most or all of the kidney structures. Some of the earlier confusion caused by this terminology arose from the fact that certain cases of diffuse nephritis presented morbid phenomena which corresponded to those found in nephrosis, as well as those peculiar to nephritis.

The term nephrosis as now generally applied represents in reality a compromise between pathologist and clinician. From the pathological standpoint it includes all forms of renal disease with tubular degeneration ranging in degree from cloudy swelling to necrosis and amyloid degeneration, while according to the clinical concept, the term refers to a group of diseases with edema, oliguria, and albuminuria, possessing characteristic biochemical changes in the blood.

The pathologic prototype of nephrosis is the acute nephrosis or that degenerative process of the kidney tubules, which results from certain metallic poisons and bacterial toxins (as in Hg poisoning or diphtheria, etc.)

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The clinical course of these cases is specific and differs widely from that manifested by the group of cases generally designated as chronic nephrosis. Chronic nephrosis in its purest form is a disease which begins insidiously, is of unknown origin and runs a long course characterized by albuminuria, oliguria, edema, without circulatory changes or impairment of renal function, but with certain distinctive changes in the blood.

Despite the difference in the course and character of the acute and the chronic nephroses emphasis is laid principally, by virtue of the term employed, upon the lesions present in the kidneys in both varieties, and yet, it is very questionable whether any link in their pathogenesis actually exists. The direct transition of an acute into a genuine chronic nephrosis is not known to occur.

Notwithstanding the fact that both the acute and chronic types have a common pathologic designation, it is the chronic forms with which we are chiefly concerned. These include three distinct clinico pathologic varieties: the primary or genuine, or lipoid nephrosis, glomerulo nephritis with changes resembling those of genuine nephrosis (the nephrotic component), and amyloid diseases of the kidneys.

Numerous efforts have been made to establish sharp diagnostic criteria for each variety. The urine, the cardiovascular system, the eye grounds, the blood, present on occasions tell-tale evidence pointing to one type of nephrosis or another. However, positive differentiation presents great difficulties, since clinically one variety may closely resemble another. Although the term nephrosis still focuses our attention upon the ultimate pathology in the kidneys, great progress has been made by the realization that other than renal factors are concerned in the clinical manifestations of these diseases. In point of fact, the question has been raised whether or not genuine chronic nephrosis is a renal or a metabolic disorder. A clinical picture resembling that of nephrosis has been recorded in which no albuminuria nor any other evidence of renal involvement is present, the origin of which can be traced

to malnutrition, due to lack of food, or a disturbance in the endogenous metabolism. In other words, failure to assimilate or rebuild the essential body proteins produces a clinical picture similar to that caused by direct loss of protein via the kidneys or any other channel. It is therefore probable that malnutrition is a factor in the protein depletion which occurs in nephrosis. The only difference between the strictly metabolic condition depicted above and that of true nephrosis resides in the albuminuria which accompanies the latter. The albuminuria is the crucial factor in nephrosis, and the entire comprehension of the disease depends upon this fact alone. Some of our difficulty in comprehending this fact arises from our limited ability in discerning cause from effect, a circumstance which leaves open the question as to the true origin of the renal pathology in nephrosis.

In its clinical manifestations and in its chemism, the true or genuine nephrosis is the prototype of all other forms of chronic nephrosis and should be considered first. The etiology of true nephrosis is not known. While the albuminuria is of necessity a renal phenomenon, it is not necessarily, as will be shown later, proof of the existence of renal disease. Some evidence suggests a metabolic derangement as the pathogenic factor. According to this concept the albuminuria is the fundamental disorder and the degeneration of the tubular epithelium of the kidneys, which is characteristic of nephrosis, is an incident in, and not the cause of the disease, while the co-existing inflammatory processes and amyloid deposits may be either independent or incidental.

In the opinion of most pathologists, the kidneys in genuine nephrosis show no evidence of inflammation. Total absence of glomerular lesions is required by some pathologists as a necessary condition for the proper classification of this disease. The tubular degeneration and lipid infiltration characterizing nephrosis are not of inflammatory origin. However, because of the renal aspects of the disease other pathologists claim it as a degenerative type of nephritis in which the inflammatory

processes subside and the degenerative tubular lesions persist

The first and foremost manifestation of nephrosis is an intense albuminuria. In acute nephrosis (or that following metallic poisoning or certain bacterial intoxications) the albuminuria, while often intense, is usually of short duration and constitutes merely a sign of the intoxication and no more. In chronic nephrosis, however, the albuminuria is not only intense but is of long duration, lasting months and years. In the light of our present knowledge it stands in immediate relationship to the secondary and characteristic clinical phenomena of all chronic nephroses, namely the edema and the blood changes. The character and duration of these phenomena are often commensurate with the degree and duration of the albuminuria. In the so called genuine nephrosis, the entire clinical complex appears to be so dependent upon the excretion of albumin in the urine, that the term "Diabetes Albuminicus" has been suggested by which to designate this condition.

In many instances the albuminuria appears long before any other evidence of disease develops, and its finding may be accidental or casual. The question which requires our first consideration, therefore, is the albuminuria. How is it produced? The proteins present in the urine in albuminuria have been found to be identical with the proteins of the blood. Little if any of the urinary protein is derived from the kidneys. Normally the urine is practically free of protein. The kidneys permit the effete products of metabolism and water to go through but hinder the proteins from leaving the blood stream. However, the passage of protein into the urine occurs in a variety of conditions without concurrent disease of the kidneys. The so called benign albuminurias belong to this category. They may be of considerable intensity and last for long periods of time, but they are self-limited, and rarely if ever terminate in nephritis.

The passage of protein into the urine is ascribed to a change in the renal filter, conditioned by circulatory changes in the glomeruli. The glomerular origin of the

albuminuria gains some support from the fact that the urinary protein in all albuminurias, whether benign, nephritic or nephrotic (except in amyloid disease) is predominantly serum albumin, namely that fraction of the blood proteins with the smallest molecular configuration.

Face to face with the belief in the glomerular origin of protein excretion stands the fact that the most intense albuminuria occurs in those cases in which the renal tubules, and not the glomeruli, are affected most, whereas, when the glomeruli alone are involved (as in glomerulitis) the least protein is excreted in the urine.

The manner in which the transport of protein from the blood to the urine takes place cannot be regarded as fully determined. The possibility that the renal tubules participate in the excretion of albumin cannot be ignored, particularly as the mechanistic concept of increased glomerular permeability fails to explain the capacity which the kidneys possess, not only of segregating and excreting the blood proteins according to the size of their molecules, but also to eliminate selectively foreign proteins and colloids of the same or higher molecular configuration than those native in the blood. Hemoglobinuria presents a striking example of the selective excretion just alluded to. It is reasonable, therefore, to assume that it is not only the size of the protein or colloid molecule, but a vital inadequacy or a structural change affecting its biologic character which determines the selective elimination of protein from the blood.

The assumption that albuminuria is caused by renal disease is natural, but not conclusive. The fact that the two are commonly associated constitutes an important coincidence, but the exact sequence has not yet been established. What is regarded as cause may only be effect, and vice versa. It is difficult to reconcile the albuminuria of chronic nephrosis with a bizarre and haphazard elimination of protein conditioned by unsubstantiated morphologic change in the glomeruli.

The occurrence of the albuminuria may have another explanation. As stated before, the albumin in the urine



is identical with the protein of the blood. Protein, like cell protoplasm, is plastic in nature and capable of biologic change. The change is qualitative in character, too fine for chemical analysis, but gross enough for the living tissue cells to detect. The life and function of each cell and tissue in the body depend in a large measure on the *biologic accord* existing between the cells and the blood proteins. It is difficult to define this relationship in any other terms. It eludes chemical analysis, but its reality is certain. The blood of one species of animal differs from that of another principally by virtue of the biologic properties of the proteins which it contains. In immunity the capacity of the proteins in the blood, and the protoplasm of the tissue cells for biologic variation and readjustment, is conceded to be of vital importance to the organism. To the best of our knowledge, an immune serum differs from a non immune serum of the same species of animal in the biologic sense only, chemically the two are indistinguishable. Any change in the blood proteins, however slight, can alter their biologic relation to the tissue cells.

From what we know of the behavior of colloids in general, alterations in pH or a shift in the character or composition of the associated salts or their respective ions may be sufficient to disturb the biologic accord suggested above. Many causes can produce such a change, for example, infections, intoxication, changes in temperature, asphyxia, anoxemia, deficiency of proper food factors, disturbance in acid base equilibrium, dysfunction of the endocrine glands and parenchymatous organs, etc. If the tissue cells fail to adapt themselves to the new conditions, the blood proteins cease to be supportive or normal in character. They may then be treated as foreign matter and ultimately excreted from the body. By such a mechanism albuminuria becomes a natural and protective process and not a paradox in renal physiology. The morbid manifestations of nephrosis result either from the non-utilization of the proteins or their excretion, or both. It is only in consequence of the excretion of protein from the blood into the urine and its ultimate effect upon the

organism that the much discussed varieties of "nephrosis" assume the same secondary clinical manifestations, namely, the blood changes, the edema and the oliguria.

### *The Blood Changes*

The first demonstrable effect of the albuminuria is the change in the content and composition of the blood proteins. Their content decreases, and the fall is proportionate to the duration and intensity of the albuminuria. The output of protein in the urine may range from 5 to 50 grams a day. The total amount of protein in the blood serum of a normal full grown person weighing 70 kilograms is approximately 200 grams. The albuminuria in nephrosis is of great intensity and may last many weeks or months, so that the protein depletion of the blood may be considerable. Thus while the normal protein content of the blood serum ranges between 6.5 and 8.2 grams per 100 c.c., in the nephroses values below 2 grams per 100 c.c. have been recorded. Coincident with the decrease in the total protein content is the change in the quantitative relations of the individual constituents of the blood. Whereas normally the proportion of the globulin to albumin is approximately as one to two, in these cases the globulin content rises and may constitute the major part of the protein present. Occasionally the inversion reaches extreme proportions, and values have been found in which the globulin constituted as much as 95 per cent of the total serum protein. This remarkable change in the blood cannot be wholly accounted for by a greater elimination of albumin in the urine. Its increase may be absolute as well as relative, and evidence can be adduced that it is of tissue origin. It is certain that the changes just discussed are not due to hydiemia or blood dilution.

Various studies indicate that loss of protein from any cause produces a reduction of the protein content of the blood serum. Thus extensive transudation of serum into the serous cavities and into the skin, caused by circulatory failure or static disturbances incidental to the pressure of

neoplasms on blood vessels, hepatic cirrhosis or occlusion of the vena cava (particularly if such fluid accumulations are removed by repeated puncture) is accompanied by a reduction of the protein content of the blood serum. The experimental removal of blood plasma (plasmapheresis when frequently repeated also causes a diminution of the protein content of the blood. Rarely is the impoverishment of the blood in serum protein so pronounced, or the inversion of the albumin-globulin ratio of such magnitude, as it is in the true chronic nephrosis. In purely inflammatory diseases of the kidneys and in any condition in which the anatomic integrity of the kidneys alone is disturbed, even to the point of complete destruction (surgical conditions), such changes are not encountered.

Another effect which accompanies the severe loss of protein from the blood is the accumulation of lipid material. A milky appearance of the blood serum due to fatty substances was observed by a number of earlier investigators, in connection with renal affections, but its origin and nature was not determined until recent times. But while the milky appearance of the blood serum is to be observed in some cases, it is absent in others. Nevertheless an increase in the fatty substances is a fairly constant finding. One of these fatty substances, the cholesterol, has been studied intensively. This substance is invariably increased during the active stages of the disease and more particularly when edema is present, and it may attain extraordinary heights. Values six to eight times the normal are not uncommon.

The cause of this hypercholesterolemia is uncertain. The origin of the cholesterol present normally in the blood has not been fully ascertained. Undoubtedly some of it is exogenous and some endogenous. It is subject to fluctuation under a variety of conditions. In some it appears to be less dependent upon external causes than in others and is definitely associated with metabolic disturbances. Dysfunction of certain endocrine glands, especially that of the thyroid and adrenal, may play a part in determining the cholesterol content of the blood.

The lipoidemia of nephrosis is quite unique. It differs from that of diabetes mellitus. It bears no relation to carbohydrate metabolism and is not associated with either acidosis or ketogenesis. It appears rather to arise directly from impairment of protein metabolism, or protein loss. The lipid rich serum of nephrosis differs also in its physical appearance in that free fat is not separated from the serum upon standing or centrifugalization. It appears thus to be in closer physical or chemical contact with the blood proteins, particularly globulin, a circumstance probably of some moment in determining the preferential excretion of albumin in the urine. It behaves differently in a metabolic sense also, since it does not lessen or disappear upon the elimination of fatty foods from the diet. In its general character, the lipoidemia of nephrosis is more like that which arises in endocrine disturbances, particularly in hypothyroidism. It is greater in intensity in nephrosis than in any other known disease.

In seeking an explanation for this phenomenon we find evidence which points to a deficient protein metabolism as the cause of the hypercholesterolemia. This is gleaned from the fact that a certain relationship is frequently observed between the cholesterol content of the blood and the basal metabolism. Although the association is not constant, it may be said in general that conditions which depress the metabolic processes of the body cause an increase in the cholesterol content of the blood, while those which augment metabolism cause a decrease. Thus protein starvation, loss, or non utilization cause a lipoidemia, while, conversely, protein feeding, pyrexia, and thyroid administration uniformly reduce the lipoidemia. Protein feeding augments metabolism by its specific dynamic action, fever heightens protein catabolism, while thyroid promotes the utilization and catabolism of protein, all these effects are usually accompanied by a fall in the cholesterol content of the blood. These facts, as we shall see later, bear directly on the course and the treatment of the diseases in question.

In a measure the lipoid accumulation in the blood in this disease is proportional to the loss of protein sustained by the blood and to the degree of systemic disturbance which accompanies it. It is perhaps the best measure that we possess of tissue starvation and the metabolic depression. It is superior to the basal metabolism as a measure of deficient protein metabolism and is frequently demonstrable even when the protein content of the blood has not been reduced to a definitely pathologic level.

Among the blood findings there is one other that is regarded as distinctive. That is the non protein nitrogen. The lack of retention of this constituent in the blood in genuine nephrosis is usually considered as a criterion in the differential diagnosis between this condition and true renal disease. This, however, is misleading because retention of nitrogen in the body takes place in both types of diseases, although in genuine nephrosis it is due to a different cause and is not manifest in the examination of the blood.

The content of the waste products in the blood in the nephroses depends on two factors: the concentrating power of the kidneys, and the water retention of the tissues. In cases of genuine nephrosis the concentrating power of the kidneys is not disturbed but a certain amount of nitrogen waste products is retained in response to the retention of water—which is due to extra-renal factors. Then concentration in the blood remains low because of their diffusion in the water-logged tissues. This is borne out by the fact that when the edema subsides in such cases the waste products dissolved in the edema fluid are transported to the blood and there follows a temporary azotemia or increased nitrogen content of the blood. This results from a difference in the rate of excretion of water and solids by the kidneys, conditioned by the extra renal factors responsible for the edema. In the uncomplicated cases water and salts are eliminated first, then the nitrogen waste products which lag somewhat behind. Thus an azotemia develops and persists until the accumulated nitrogen waste products of the blood are completely eliminated.

In all other cases in which the kidney filter is affected and the concentrating power decreased, there is a persistent lag in the excretion of nitrogen waste products with the result that the retention of these substances is proportionately greater than the retention of water, and, failing proper dilution, these nitrogen waste products become concentrated alike in the blood and tissue fluids. This is an important differential point between genuine nephrosis and the nephritides with nephrotic manifestations.

Hematologically, the blood in genuine nephrosis undergoes little or no change from the normal. In nephritis with nephrotic manifestations and in amyloidosis, the hematology is an expression of the intoxication resulting from renal insufficiency.

### *The Edema*

One of the most striking clinical manifestations of nephrosis is the development of edema. Its occurrence is intimately associated with a diminished excretion of urine. Oftentimes it is the first symptom of which the patient complains, and thus leads to the clinical recognition of the malady.

Various explanations have been offered in the past for the occurrence of edema in renal diseases. Indirectly they all attributed the phenomenon to the retention of water and salts resulting from the inability of the kidneys to eliminate them adequately. The position of the kidneys in the body economy, however, is such that a change in renal function may be the expression of extraneous influences, and retention of salts and water causing edema may be due to factors other than renal insufficiency. The fact that the edema in nephrosis is largely of extra-renal origin came to light in 1917, when it was realized for the first time, that the proteins of the blood were definitely concerned with its development. Some phases of its mechanism appear to be relatively simple.

Between the circulatory medium and the working cells of the body one or more membranes are always interposed. The walls of the blood capillary vessels constitute one such

membrane All substances that play a part in the nutrition of the cells, as well as the products elaborated by them so far as they enter the blood stream, must pass through the walls of the capillaries The question of how the fluid exchange through the capillary walls is brought about hinges ultimately upon two principles, namely, the intracapillary pressure and the osmotic pressure

Blood plasma and tissue fluid are identical in everything except the proteins which they contain Normally the blood plasma contains more protein than the tissue fluid The capillary membranes ordinarily are impermeable to the proteins of the blood plasma within the vessel walls These plasma proteins or colloids, unable to leave the capillaries, create an osmotic pressure and by virtue of their greater content tend to attract and retain fluid in the blood The intracapillary pressure on the other hand works in the reverse way Accordingly, as the capillary endothelium is normally impermeable to the proteins of the blood the movement of the fluid through the capillary walls depends primarily on the balance between the intracapillary pressure and the osmotic pressure of the plasma colloids An excess of intracapillary pressure would therefore cause fluid to pass towards the tissues while a converse relation would lead the movement of fluid into the blood Otherwise stated, the direction and the amount of movement of fluid through the capillary walls is determined principally by the level of the intracapillary pressures in association with osmotic factors

The effect of the two operating forces, however, is different The one, capillary pressure, must cause the passage of fluid that is of approximately the same composition as that contained at the source For example, if transudation occurs because of increased capillary pressure, the migrating fluid must be like that of the blood serum or plasma This is verified by the composition of effusions encountered in conditions of static disturbance, such as cardiac decompensation, cirrhosis of the liver, etc When intracapillary pressure is lessened (as after hemorrhage) the composition

of the fluid which passes from the tissues into the blood stream must be like that of the tissue fluid. It is known that the fluid which passes from the tissues under these conditions actually contains appreciable amounts of protein.

On the other hand, the fluid which passes in response to the osmotic pressure of colloids should be water or an aqueous solution of salts. Analysis of the edema fluids in chronic nephrosis show the composition to be one of salts and water. The protein content is insignificant and may be derived from the original fluid of the tissue spaces.

Thus we have in these considerations a set of facts which dovetail and afford a basis for the comprehension of the mechanism which leads to the production of edema. It is recognized on the one hand that the blood serum contains more protein, i.e. more colloid material, than the tissue fluid and that by virtue of this predominance it possesses a greater osmotic pressure than the surrounding tissue fluid, which is vital in maintaining a balance in the exchange of fluid between the blood and the tissues. Speaking figuratively, the osmotic pressure can be compared to the sucking action of a sponge. The examination of the blood, as already pointed out, in cases of nephrosis reveals the fact that the protein, i.e. the colloid content, is very much reduced, and a loss sometimes equivalent to 60 or 70 per cent and more of the total serum protein, often occurs. In terms of osmosis this loss of protein represents a decrease in pressure sufficient to disturb the equilibrium necessary for the normal exchange of fluid between the blood and the tissues. More precisely, the deficit in the serum protein causes a fall in the osmotic pressure of the blood. This disturbance does not only favor the passage of fluid from the blood to the tissue, but also gives to the tissues the controlling power to absorb and retain fluid. Again, as stated before, from the very nature of the force concerned in the process (that of osmosis) the fluid which passes from the blood to the tissues must be a solution of salts. The effusion fluids in the disease under discussion are such solutions.



In discussing the clinical character of genuine nephrosis it was observed above that it is of slow and insidious onset and that the edema is often its earliest symptom. This of course does not signify that the edema marks the beginning of the disease. On the contrary, the presence of edema indicates that the malady is already in an advanced stage. It shows further that the albuminuria has been of sufficient intensity and duration to bring the protein content of the blood to a pathological level.

The exact clinical development of the edema in genuine nephrosis is interesting and worth noting. The function of the kidneys, as is known, may in this disease show slight or no impairment according to the usual tests. But a prolonged and careful study of water metabolism shows that retention of water in the body takes place long before the edema becomes distinguishable. The protein content of the blood serum in such instances shows a moderate reduction below the normal. At a later stage in the disease the edema makes its definite appearance, but is not constant. It may be observed either in the face or back when the patient is in a recumbent position, or in the lower extremities when the patient is up and about. This occurs when the protein content of the blood serum has been reduced to such a level that a critical point in the exchange of fluids between the blood and the tissues has not been reached, but factors of gravity may disturb the balance and thus determine the formation and localization of the edema. It is found at this stage that the blood protein content is still close to 6.0 gms per 100 c.c. When, however, the protein content of the serum falls to about 5 gms or lower the edema becomes generalized and is permanent. Posture alone no longer determines its presence or location. In the absence of vascular disturbances, cardiac or hepatic diseases, or inflammation of the kidneys (glomerulonephritis), the critical point in respect to the blood serum proteins—the point at which the edema becomes a constant symptom of the disease—is approximately 5 gms per 100 c.c. It is important to reiterate that the reduction in

the content of the blood serum proteins is due to protein loss and not blood dilution

### *Etiology*

In the foregoing discussion, the importance of the albuminuria in the clinical evolution of nephrosis was particularly stressed because it is in consequence of the copious excretion of protein from the blood that the three varieties of the chronic nephroses acquire similar clinical characteristics. If, therefore, we assume that the so called "nephrotic" element (comprising the blood changes, the edema, the oliguria) is in all of them due to one single factor—the albuminuria, the differences as well as the similarities between them cease to be perplexing. Pathologically they have but one feature in common—namely, degeneration of the renal tubules. As indicated, in primary or genuine or lipid nephrosis, degeneration of the renal tubules is the only alleged pathological change. No other system is affected. There is no hypertension nor any other cardiovascular change. There is no involvement of the eye grounds. Renal function is not disturbed, and pathologic retention of nitrogen in the blood is not demonstrable.

The nephritides with the nephrotic component show all the sequelae of renal inflammation plus those changes in the blood which are directly traceable to the loss of protein occasioned by the albuminuria—namely, the hypoproteinemia, inversion of the protein fractions and the lipoidemia. The edema in these cases may be the composite result of the hypoproteinemia, renal insufficiency and circulatory changes. In amyloidosis, the conditions may be of the same nature as in the nephritides with the nephrotic component—plus certain reactions which are regarded as peculiar to amyloidosis—namely, the predominance of globulin in the urine, the presence of waxy casts—and a positive congo red reaction in the blood. Here again the nephrotic element is conditioned by the protein depletion of the blood resulting from the albuminuria, and not from any pathologic change attributable to amyloidosis.

The basic disturbance in each variety is peculiar unto itself and hence etiologically unrelated. The causes which lead to the development of nephritis or amyloid degeneration of the kidneys are well known—they belong to a separate chapter and need not be considered here. The etiology of genuine nephrosis, however, is still in the realm of the unknown. It occurs most often in young adults and children. The earlier impression that it affects females more often than males, and that it is restricted to the poorer classes should be corrected now.

The individuals particularly prone to this malady are of a peculiar flabby type—some being definitely obese before the disease is discovered. The occurrence of repeated attacks of urticaria marks the early history of some of the cases, and an allergic diathesis must be considered as a possible factor in the etiology of chronic nephrosis.

While in most instances the disease begins insidiously, occasionally it is ushered in by an infection, or it may occur during or after pregnancy, or in the course of some endocrine disturbance—notably hypothyroidism. The transition from hypothyroidism to nephrosis and from nephrosis to myxedema has been observed. While syphilis and tuberculosis are sometimes the cause of chronic nephritis and amyloidosis—they seem to play no part in the etiology of genuine nephrosis. An acute nephrosis in the second stage of syphilis is sometimes encountered—but its transition into a true chronic nephrosis is questionable. The presence of a history of syphilis or a positive serology are no proof of the etiologic relation of lues to genuine nephrosis.

If it is remembered that most cases of chronic nephrosis are discovered at a time when the disease is already well advanced, the factors considered in relation to its etiology may be only incidental and not necessarily generic.

#### *Treatment and Prognosis*

In the introductory remarks on the primary or genuine nephrosis, the question was raised as to its real nature

Is it, or is it not a renal disease? It was intimated that in some respects it bears the earmarks of a metabolic disorder. Upon the correct interpretation of the nature of this disease depend two very important questions namely, the treatment and the prognosis.

Most true renal diseases which run a chronic course are progressive in character, and in spite of every form of treatment ultimately prove fatal. Upon this basis primary or genuine chronic nephrosis is not a renal disease. Apart from the albuminuria, its resemblance to the clinical condition which results from pure protein starvation is certainly very great. Furthermore experience teaches that although its etiology is uncertain and its duration is usually long, it is amenable to treatment and cure. In essence, genuine nephrosis represents a subversion of protein metabolism. Whatever the cause of the albuminuria may be, the loss of protein substance from the blood, the lipoidemia, the edema and the reduced basal metabolism point to tissue starvation. Hence the treatment to be effective must address itself to these specific indications. Briefly, it resolves itself into three definite propositions.

- 1 To replace the protein loss of the blood plasma by means of an adequate protein diet. In extreme cases blood transfusion may be necessary.

- 2 To compel the tissues to utilize the protein and incidentally to reduce the lipoidemia. This, too, is often accomplished by a liberal protein, but fat-poor diet. The administration of thyroid aids in attaining this desideratum.

- 3 To reestablish normal metabolism. When high protein feeding fails to accomplish this the institution of thyroid is definitely indicated. The main purpose in the use of thyroid is to stimulate protein utilization. It does not aim to replace protein feeding which is fundamental in the treatment of this disease.

The dietary rules are simple, and are amply discussed in the literature. A few remarks on the use of thyroid, however, are in place, particularly because the position

which this agent occupies in relation to chronic nephrosis is very unique

As stated the purpose in the use of thyroid is solely to accelerate metabolism and thus promote the utilization of protein. The amount of thyroid often necessary to combat the metabolic depression in nephrosis cannot be measured in terms of thyroid hypofunction. It is frequently many times that required in mixedema to reestablish normal metabolic conditions, and the tolerance exhibited by patients with nephrosis for thyroid substance or its active principle thyroxin is quite extraordinary. Details of procedure in its use are recorded in the literature and need not be considered here. Suffice it to say, that thyroid is used only as an adjunct to high protein feeding. Symptoms of intoxication from the use of thyroid are rather exceptional—and when they do occur, are usually temporary and of mild degree.

The symptomatology of genuine nephrosis is so closely interwoven with its biochemistry that whatever modifies its chemism in the right direction, relieves its symptoms and improves the condition. Thus by virtue of a common attribute, stimulation of protein metabolism, beneficial results may follow high protein feeding, thyroid administration and occasionally fever. A bout of fever sometimes marks the turning point towards recovery in a specially refractory case. The use of diuretics for the relief of the edema is occasionally necessary. Amongst those used, urea, calcium and the ammonium salts are preferable. While the mercurial diuretics yield the most dramatic effects, the results are ultimately deleterious and their frequent use is undesirable.

Relief of symptoms and improvement alone are not the sole objects of treatment in genuine nephrosis. Experience teaches that in the absence of uncontrollable and hopeless complications, they are susceptible of complete cure when therapy is intelligently and persistently applied. This may require months or years to accomplish.

The presence of complications alters the outlook and often necessitates modification of the therapeutic pro

cedures. The commonest accident is infection in which the pneumococcus is the chief offender. The biochemical changes which take place in nephrosis seem to render the conditions particularly favorable for the invasion and multiplication of this microorganism. The seat of infection is variable: sinusitis, otitis media with and without mastoiditis, pneumonia, erysipelas and thrombophlebitis of the extremities have been observed, but the peritoneal cavity is most often affected. While such infections are of grave portent, they are not necessarily fatal.

Infections in other localities run a course which is not unlike that encountered in other conditions. The outcome depends on the severity of the infection. Occasionally the effect of an infection is rather favorable. As pointed out before, the influence of the associated pyrexia upon the general metabolism is such as to accelerate protein utilization, which high protein feeding and thyroid administration sometimes fail to accomplish. This suggests the possibility that other pyrogenic substances may be of service to initiate the metabolic changes desired in this condition. This, however, is a problem for the future.

In glomerulonephritis with the nephrotic component the treatment is complex and largely symptomatic. On the one hand efforts must be made to replenish the blood protein, on the other, a rising azotemia must often be combatted. Under these circumstances the azotemia should receive first consideration and a low protein diet must be fed until the accumulation of waste products in the blood is adequately overcome. The presence of edema under the circumstances mentioned serves as an aid in overcoming the toxic effects of the azotemia. Removal of fluid accumulated under the skin or in the serous cavities is sometimes desirable and puncture and drainage may be resorted to. When the azotemia is reduced, the protein intake may be increased to a point which is in keeping with the requirements of the body and the functional capacity of the kidneys. However, the progress of the disease is rarely permanently affected by the treatment.

pounds Albuminuria persisting On June 16, 1918, albuminuria disappeared completely Patient remained well since then with no vestige of original disease At present entering climacterium Slight rise in blood pressure without renal involvement Survival to date 19 years

Condition developed during pregnancy

*Case 3 S L* Age 22 Inmate of several hospitals prior to coming under observation on February 6, 1918 No etiology other than that of hypothyroidism Clinical findings that of chronic nephrosis Under treatment with high protein diet and thyroid for nine months with a complete recovery In perfect health to date Survival 19 years

Condition associated with hypothyroidism

*Case 4 M Z* Age 30 Case of chronic nephrosis admitted to Mt Sinai Hospital in 1919 Case complicated by positive luetic serology Condition aggravated by anti luetic treatment Discontinued Put on a high protein diet This therapy was maintained for three years with complete recovery Survival 17 years Has not been ill since, although constantly exposed to the elements because of occupation

Condition associated with luetic serology which has no etiologic relationship

*Case 5 H B* Age 12½ (nephew of case 3) Came under observation in November, 1925 Diagnosis chronic nephrosis Course complicated by an intercurrent acute hemorrhagic nephritis Hematuria persisted for six weeks Except for the latter interval, patient was on a high protein diet and thyroid for two years with complete recovery In 1936 ill with septic sore throat Chills and high fever up to 104 This lasted for two and a half weeks No recurrence of any renal symptoms and signs Survival 12 years In perfect health to date

Acute hemorrhagic nephritis in the course of a chronic nephrosis

*Case 6 B A* Age 4½ Came under observation for chronic nephrosis in December, 1926 Treated with high protein diet and thyroid (the terminal albuminuria was of lordotic origin) Complete recovery after four years Had two attacks of broncho pneumonia and frequent upper respiratory infections in the interim Since recovery had mumps, scarlet fever and a third attack of broncho pneumonia No renal complications or sequelae In perfect health to date Survival 11 years

Condition associated with two intercurrent attacks of broncho pneumonia, mumps, scarlet fever and a third attack of broncho pneumonia Without sequelae

*Case 7 C 1 B* Age 10 Came under observation in March, 1925 Alleged to be a case of chronic glomerulo nephritis following otitis media Subsequent course that of nephrosis with evidence of hypothyroidism Was on a high protein diet and thyroid for three years with complete recovery In July, 1934, cervical adenitis with high temperature followed by suppuration requiring surgery Uneventful recovery In 1936 herniotomy Uneventful recovery Completely well to date Survival 12 years

Condition ushered in with an acute infection—onset similar to glomerulonephritis Suppurative adenitis subsequently without renal sequelae

*Case 8 C T* Age 19 Admitted to Beth Israel Hospital January, 1931 Antecedent history of diphtheria at the age of three, and severe attacks of giant urticaria for two and a half years prior to present illness Clinical appearance and course that of nephrosis with evidence of hypothyroidism Treated in usual manner high protein diet and thyroxin intravenously Recovery in one year Married in August, 1932 Pregnancy and parturition in 1936 Delivery at Jewish Maternity Hospital uneventful No vestige of original disease Well to date

Pregnancy following recovery without sequelae



*Case 9 F S* Age 23 Married three years, had one normal pregnancy Onset of edema and intense albuminuria in March, 1930, came under observation in June when diagnosis of chronic nephrosis was made Treated in usual manner with complete recovery In 1933 suffered from trichiniasis and a few months later a Neisserian infection with polyarthritides Complement fixation test positive up to 1936, ankylosis of joints of hand still present In July, 1936, became pregnant Normal parturition, delivered at Sloane Maternity Hospital in March, 1937, and is completely well with no vestiges of the original disease today Survival 7 years

Recovery followed by trichiniasis, Neisserian infection and pregnancy without renal sequelae

*Case 10 L B* Age 5½ Case of chronic nephrosis with pneumococcal peritonitis Operated on because of clinical similarity to acute appendicitis Came under observation in 1933 in a moribund condition as a result of a complete intestinal obstruction, with uncontrollable fecal vomiting Patient operated on Resection of 16 inches of gangrenous small intestine Open ends of intestine left in the wound Notwithstanding leakage of intestinal contents patient began to improve Discharged from hospital six weeks later with intestinal ends still open Re operated on three months later, end to end anastomosis Uneventful surgical recovery With the improvement in the nutritional state the nephrosis completely subsided Under treatment eighteen months In perfect health to date Survival 6 years

Nephrosis complicated by pneumococcus peritonitis—intestinal obstruction Surgical intervention Recovery from nephrosis

One cannot reconcile these results with any concept or classification of genuine nephrosis as chronic glomerulonephritis

To attain these results two tenets must be adhered to 1 conviction, and 2 persistence

# THE NATURE OF HYPERTENSION\*

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Arterial hypertension is a clinical sign, not a disease. It is, therefore, not surprising that its causes are varied. Many of them are known. Clinical experience demonstrates, however, that the number of patients in whom the cause of their hypertension is discernible is vanishingly small. The majority fall into the classes known as essential or malignant hypertension, the genesis of which has thus far eluded solution.

It is, nevertheless, necessary for the orderly presentation of knowledge concerning the nature of hypertension to review that minority of hypertensive states in which the origin of the condition is known. Later in this communication an effort will be made to set these data in juxtaposition with those derived from investigation of patients suffering from essential and malignant hypertension.

Hypertension of known or incompletely known etiology may conveniently be divided according to their genesis into four categories. These divisions are (1) renal (2) cardiovascular (3) endocrine (4) central nervous.

## RENAL HYPERTENSION

Hypertension in which the kidneys appear to be chiefly responsible occurs during several morbid conditions of them. The chief of these is glomerulonephritis, acute or chronic. The mechanism of this hypertension is by no means clear. Some experimental evidence indicates that during the acute stages of the disease the hypertension may be due to overactivity of the vasomotor nerves. During the chronic stage the musculature of the peripheral arterioles becomes hypertonic due to some change in the properties of those muscles seemingly independent of the vasomotor

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\* Delivered November 4, 1937, in the Tenth Annual Graduate Fortnight, The New York Academy of Medicine.

nerves. Consequently, investigators have concerned themselves chiefly with the search for circulating pressor substances, or agents which sensitize the blood vessels to pressor stimuli, to explain the latter increase in vascular hypertonus. Pressor substances have not been found in more than normal amounts in the blood, urine, or spinal fluid of patients with hypertension and nephritis. Nor have sensitizing substances been demonstrated. Such negative evidence does not prove that they do not exist, indeed, some evidence indicates they will prove to have an essential part in the development of hypertension.

Marked reduction in the flow of blood through the kidneys does not appear to be solely responsible for the hypertension. The flow is reduced to low levels in many patients without coincident development of hypertension. Furthermore, experimental evidence suggests that, within limits, there is no direct relationship between renal blood flow and the height of arterial pressure. Alterations in the circulation of the kidneys of kinds which have not as yet been measured must not, however, be overlooked as factors in the development of hypertension because circulatory readjustments are known to occur during the course of nephritis.

Many investigators have tried to reproduce chronic Bright's disease in animals. None have been successful. Perhaps the form bearing the closest clinical similarity is the anti kidney serum nephritis. Nothing is known of the mechanism of the hypertension in these experimental animals.

Hypertension of renal origin has been produced by mechanical constriction of the renal arteries. It appears to bear no resemblance to Bright's disease except that in both, the circulatory dynamics of the kidneys may be altered. Consideration of the genesis of this type of hypertension will be deferred until later in this communication.

Hypertension occurs often during the course of pyelo-nephritis. It is not a constant accompaniment. Nothing is known of the mechanism of its genesis.

Prostatic obstruction of severe grade usually is associated with definite arterial hypertension. It is relieved by release of the obstruction to free flow of urine unless the obstruction is of very long duration. The counterpart in experimental animals is compression of the ureters by means of adjustable clamps.

Anuria, regardless of the cause, is ordinarily accompanied by moderate hypertension. The development of hypertension appears to be dependent on the presence of the kidneys in the body, for during the anuria which occurs as the result of bilateral nephrectomy, hypertension is not observed.

Polycystic kidneys also are quite regularly accompanied by moderate to severe hypertension, especially late in the course of the disease. Nothing is known of the mechanism and it has as yet no experimental counterpart.

Lastly, certain tumors of the kidney, especially the embryomata, are occasionally involved in the genesis of hypertension. It is not unlikely that at least some of the very large tumors compress the kidneys in such a manner that hypertension occurs. It has been observed in dogs that chronic compression of whole kidneys results in moderate hypertension.

There appears to be no doubt that the kidneys either cause or are associated with the genesis of hypertension in an unusually large and varied group of morbid conditions. To the investigator of the circumstances surrounding the occurrence of hypertension, the kidneys are always suspect.

#### CARDIOVASCULAR HYPERTENSION

By far the most impressive hypertension associated with cardiovascular lesions is that which occurs in coarctation of the aorta. This hindrance to the free flow of blood through the proximal portion of the aorta leads to the bizarre result of cephalic hypertension and relative or absolute hypotension in the lower portion of the body. It appears to be reproducible in animals by placing a large

clamp on the proximal portion of the aorta. If the clamp is placed below the kidneys no hypertension results, but if above them the arterial pressure rises sharply.

Lead poisoning is believed to produce hypertension by its action on peripheral arterioles. The evidence for this is not convincing. Indeed the whole question of the occurrence of lead poisoning and hypertension is in need of reinvestigation. Suffice it to say that the clinical evidence, while in many cases contradictory, indicates the importance of adequate study.

Periaarteritis nodosa, especially if the kidneys are involved, occasionally appears to cause arterial hypertension. It has no experimental counterpart and its mechanism is unknown.

Hypertension is observed commonly during heart failure. This is believed to be due to vascular constriction of reflex origin. Hypertension also often occurs during heart block. The systolic pressure is elevated out of proportion to the diastolic, which may not be elevated. Again, this is presumed to be chiefly of reflex origin.

#### ENDOCRINE GLANDS

It is conceivable that secretions of endocrine glands increase the tone of the vascular musculature either by a direct pressor effect such as is observed when pitressin is injected or that they sensitize to or are synergistic with pressor substances of other origin. Most contemporary evidence speaks against the view, for example, that sufficient pitressin or adrenine are present in the circulating blood to cause hypertension. When adrenine is present in sufficient quantities to produce hypertension, as occurs when a pheochromocytoma is present, it is readily detectable in the blood. Yet the small quantities which appear to be present may be adequate to maintain normal tone and indeed may be the essential substrate for a superimposed hypertonus.

The almost constant association of hypertension with the presence of basophile adenomata and the other characters of Cushing's syndrome strongly suggest that the

pituitary body can under special circumstances participate in the genesis of hypertension. That it directly secretes sufficient pituitrin to cause the elevated pressure has been disproven.

The identical clinical picture has been observed to be produced by a carcinoma of the adrenal cortex without obvious involvement of the pituitary. The intimate relationship of pituitary and adrenal cortex is well known and tempts one to speculate on this relationship in the production of Cushing's syndrome. But the problem of the origin of Cushing's syndrome is complex. This is further illustrated by the fact that it may follow carcinoma of the thymus gland.

Hypertension, usually of the paroxysmal type, is usually associated at least in the minds of clinicians with pheochromocytomata of the adrenal medulla. Though very rare, studies of these patients leave no room for doubt that adrenine secreted by the tumor is responsible for the bouts of hypertension. Surgical removal of the tumor abolishes the hypertension and diminishes the adrenine content of the blood to normal.

The cortical carcinomata are equally rare. Because of their ability to produce a syndrome similar to if not identical with that occurring in the presence of hypophyseal basophile adenomata, they are of very considerable theoretical interest. It will be seen later in this discussion that the adrenal cortex is intimately involved in the genesis of experimental hypertension.

The ovary has been thought to be responsible for the development of hypertension not by secreting too actively, but by secreting too little. The common association of hypertension with natural or artificially induced menopause forms the basis for this belief. Of the validity of the clinical observation there is scarcely any doubt, but of the manner in which hypertension is produced, there is not one shred of evidence. Common and disabling as this unfortunate condition is, investigators have contented themselves by merely noting the association.

Toxemia of pregnancy and eclampsia cannot as yet justifiably be placed in any definite etiologic category. Clinically it bears much resemblance to malignant hypertension. The fact that its appearance is conditioned by pregnancy suggests that at least some part of the genetic mechanism is participated in by the sex hormones. Again the fact must be faced that ignorance of these diseases is abysmal.

Last among the endocrine glands known to be associated with development of arterial hypertension is the thyroid. The elevation of systolic pressure with but slightly raised diastolic pressure is too well known to require further comment. Less well known is the fact that some patients suffering from bouts of what appears to be Graves' disease later, and often very much later, develop typical essential hypertension. But the association may be more intimate. Such for example was the case of a girl of eighteen years of age who developed acute symptoms and signs of Graves' disease almost immediately after a soul-stirring emotional episode. Several weeks after this the typical clinical picture of malignant hypertension was present. The patient died nine months after the onset. These observations suggest that many cases of hypertension owe their origin at least in part, indirectly and in rare cases directly, to disturbance in endocrine secretions.

#### CENTRAL NERVOUS SYSTEM

The nervous system appears to be involved in the genesis of hypertension during several morbid states. The part it may play in the etiology of essential hypertension will be briefly discussed later.

Hypertension has been observed to occur in a few instances during poliomyelitis and ascending paralysis. This is the exception and not the rule. More careful study will be necessary before full acceptance can be given this as a cause of hypertension.

Hypertension results from increased intracranial pressure. This phenomenon finds its counterpart in the rise in arterial pressure which occurs when the intracranial

pressure is artificially increased in experimental animals. The mechanism of the increase in arterial pressure when kaolin is injected into the cisterna magna is not known. It is possible that it results from local increase in intracranial pressure. This type of hypertension appears to be purely of vasomotor origin for it is abolished by total sympathectomy.

Sclerosis of the carotid sinus is believed by some investigators to be responsible occasionally for hypertension. If it occurs at all, it is probably very rare. It was searched for in human beings because of the observation in animals that resection of the sinus nerves and the aortic nerves leads to chronic hypertension. Again, in man acute hypertension appears to have followed direct resection of the glossopharyngeal nerve. However interesting these observations are, it is improbable that this mechanism is an important one in the genesis of human hypertension.

The known or partially known causes of arterial hypertension have been reviewed. It has appeared profitable to do this before consideration of the baffling problem of the origin of essential and malignant hypertension.

#### NATURE OF ESSENTIAL HYPERTENSION

The chief physiological mechanisms involved in the maintenance of arterial blood pressure are

- 1 Blood volume
- 2 Blood viscosity
- 3 Cardiac output
- 4 Resistance to flow of blood in the blood vessels, chiefly in the arterioles

The first three have been proven to be normal in patients suffering from essential hypertension and can therefore be dismissed. Increased impedance to blood flow by arterioles which are hypertonic is generally agreed to be responsible for the elevated arterial pressure. It is necessary, therefore, to examine more closely the methods by which the body produces this increased peripheral resistance. In short, the problem is resolved into what may



be termed the neurogenic theory of vascular hypertonus and the angiogenic (intrinsic) theory of hypertonus

Time does not permit a review of the interesting evidence in favor and against each of these theories. Suffice it to say that neither has been proven beyond doubt, but that both have strong support.

It is possible that the nervous system is hyperactive and showers impulses on vessels which respond normally. The result would be continued hypertonus. Conversely, the nervous system may be normal and vessels hyperactive, so leading to the same result. Neither of these possibilities has been proven. Somewhat analogous reasoning may be applied to the angiogenic theory, i.e., normal arteriolar musculature may be stimulated to overactivity by increased amounts of pressor substances or abnormally sensitive vessels may exhibit excessive response to normal pressor substances. Again there are few data on which to base a decision. As yet it has not been shown that in the blood, urine, or spinal fluid there is an excess of pressor substance. But the results of such investigations must be accepted with caution. The most that can be said is that with the methods employed no excess or unusual pressor substance has been demonstrated. Nor has a deficit in depressor substance been found. The second argument, namely that the vessels are abnormally sensitive, has also not found any indubitable support. Clearly, then, data are insufficient on which to base any explanation of the way in which hypertonus occurs and yet this is the nub of the problem of hypertension.

It may be profitable to compare the results of investigations concerned with human hypertension and hypertension produced in animals. The most impressive of these is that produced by gently constricting the renal artery as shown by Goldblatt. At first glance it would appear that this so-called "renal ischemic" hypertension bears little resemblance to essential hypertension in human beings. As more and more experimental work appears, it is apparent that this is not so. What evidence indicates similarity?

The blood volume and blood viscosity in experimental hypertension is normal just as it is in essential hypertension. The cardiac output is also normal, in short, the problem again appears as to the manner in which narrowing of the peripheral blood vessels has occurred. But here the answer is conclusive. None of the following surgical procedures either prevent the development of hypertension when the clamp is applied to the renal artery, nor do they abolish it when established, renal denervation, splanchnic nerve resection, anterior spinal nerve root section (6th thoracic to 1st lumbar segments), total sympathectomy combined with cardiac denervation and destruction of the spinal cord. It appears that the nervous system plays no *essential* part in the genesis of this type of hypertension. Since removal of the clamped kidney at least before hypertension has long persisted causes the hypertension to disappear and hypertension can be produced by clamping even a kidney transplanted into the groin or neck, it seems safe to conclude that some substance is produced in the kidney vitally concerned in the production of the hypertension. But it is not certain that this substance has a direct pressor effect. The evidence for this latter statement is as follows:

Removal of the pituitary gland from animals with established hypertension causes it to be abolished or reduced. But the capacity of the body to respond to the stimulus of further constriction of the renal arteries is not lost, it is merely dampened. The pituitary gland appears to play only a secondary part in the genesis of the hypertension. It is natural to think that among the known effects of hypophysectomy the removal of its stimulating action on the adrenal cortex would be of importance in its effect on the vascular system. Loss of the tonic effect of its pressor principle might also be of importance.

That the first of these effects is probably of great importance is shown by the fact that removal of both adrenal glands abolishes established hypertension and prevents its development. Moderate hypertension can be produced if the animal is vigorously treated with salt and cortical

extract The adrienal medulla is not essential but the cortex is The effector substance from the kidney apparently acts in conjunction with secretion of the adrienal cortex to produce hypertension The manner in which this is done is wholly unknown

It has been my working hypothesis that the secretions of some endocrine glands, for example the adrienal cortex, are concerned with the maintenance of the vascular system in a state of reactivity Lacking this state, owing to their removal, the vessels no longer respond to chemical pressor stimuli It should be pointed out that although abnormal effector or pressor substances have not been demonstrated in the blood of these hypertensive animals, the physiological evidence points indubitably to their presence

Much work is now in progress in several places in this country concerned with the quantitative determination of pressor substances in the kidneys, blood and urine of hypertensive dogs It is, in my opinion, premature to make any statement regarding this work It would probably only serve to confuse a very complex problem which needs time and careful experimentation for its solution

The manifestations of experimental hypertension are similar in many respects to clinical hypertension, but how far this similarity goes cannot as yet be foreseen It is difficult to believe that clues to the mechanism of human disease will not be found in careful investigation and comparison of experimental with clinical hypertension



## LIBRARY NOTES

### DR J RAMSAY HUNT

At the October meeting of the Committee on Library, it was moved and carried that the following Minute, commemorating the services of Dr J Ramsay Hunt to the Academy be prepared and sent to Mrs Hunt and also to the *Bulletin* for publication

It is with deep regret that the Library Committee records the death on July 22, 1937, of Dr J Ramsay Hunt, a distinguished neurologist and Fellow of the Academy. Dr Hunt was unusually interested in the Library and was a very frequent visitor as a reader. For this very reason he knew its peculiar needs and the Committee on Nominations was wise in nominating him as a Member of the Committee on Library in the autumn of 1923. He was elected by the Fellows and served as a member for five years, during the last of which, 1928, he acted as Chairman. Dr Hunt, on the completion of his term of office, was nominated again and was a member for five years more, being Chairman during the year 1933.

As far as we can remember, Dr Hunt served for a longer time on the Committee than any other man. This period coincided with important developments in the history of the Library, and during those years he sat on the Council and took part in its deliberations which resulted in the decision to leave 43rd Street and erect the new building. He played no small part in the expansion of the Library. He was regular in attendance at the meetings of the Committee where his advice and wise counsel were of the greatest service, here also he insistently upheld privileges and rights of the Fellows. Dr Hunt served on more than one active subcommittee, and in the spring of 1936 he was invited to return to us again and to act as Chairman of another subcommittee which considered and reported upon the future needs of the Library. He accepted the position, we are thankful to say, and worked hard as he had done before for ten years.

This Committee full of gratitude for Dr Hunt's continued interest in, and labors for, the Library send their sincere sympathy to Mrs Hunt in her loss

RECENT ACCESSIONS TO THE LIBRARY

("Possession does not imply approval")

- Anthony, A J Funktionsprüfung der Atmung  
Leipzig, Barth, 1937, 226 p
- Ascoli, A Esperimenti di vaccinazione antitubercolare  
[Milano, Milesi, 1937], 295 p
- Bastedo, W A Materia medica, pharmacology, therapeutics and prescription writing 4 ed  
Phil, Saunders, 1937, 778 p
- Bogert, L J Fundamentals of chemistry 4 ed  
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- Bullowa, J G M The management of the pneumonias  
N Y, Oxford Univ Press, [1937], 508 p
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N Y, Macmillan, 1937, 2 v
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- De Lee, J B & Carmon, M C Obstetrics for nurses 11 ed  
Phil, Saunders, 1937, 659 p
- Deutsch, A The mentally ill in America, a history of their care and treatment from colonial times  
Garden City, Doubleday, 1937, 530 p
- Donaldson, S W The roentgenologist in court  
Springfield, Ill, Thomas, [1937], 230 p
- Dunwiddie, M A history of the Illinois State Nurses' Association  
[n p], Illinois State Nurses' Assoc, 1937, 181 p
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Springfield, Ill, Thomas, 1937, 201 p
- Ford, F R Diseases of the nervous system in infancy, childhood and adolescence  
Springfield, Ill, Thomas, [1937], 953 p
- Friedmann, E J Sterols and related compounds  
Cambridge [Eng], Heffer, [1937], 100 p
- Galdston, I A Maternal deaths—the ways to prevention  
N Y, Commonwealth Fund, 1937, 115 p
- Garibaldi, A Mecanismo probable de la cancerización  
Lima, Facultad de Ciencias Médicas, Univ Mayor de San Marcos, 1936, 2 v in 1
- Gehe & Co Wissenschaftliche Abteilung Gehes Codex der pharmazeutischen und organotherapeutischen Spezialpräparate 7 Aufl  
Dresden, Schwarzek, 1937, 1787 p

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Torino, Minerva Medica, 1937, 413 p
- Gladwin, M E *Ethics, a textbook for nurses* 2 ed  
Phil, Saunders, 1937, 365 p
- Gorlitz, W *Wachter der Glaubigen, der arabische Lebenskreis und seine*  
*Arzte*  
Hamburg, Sieben Stabe Verlag, [1936], 153 p
- Great Britain Ministry of Health *Report on an investigation into*  
*maternal mortality*  
London, H M Sta Off, 1937, 353 p
- Heil, M *Erlebnisse einer Schwester*  
Rudolstadt, Mitzlaff, 1936, 146 p
- Hertzler, A E *The technic of local anesthesia* 6 ed  
St Louis, Mosby, 1937, 284 p
- Investigation (An) into questions of social hygiene in the counties of*  
*Vasterbotten and Norrbotten, Sweden*  
Lund, Ohlsson, 1937, var pag
- von Jagdic, N & Flaum, E *Therapie der Herzkrankheiten* 2 Aufl  
Berlin, Urban, 1937, 342 p
- Kaplan, I I *Radiation therapy*  
N Y, Oxford Univ Press, [1937], 558 p
- Korschelt, E & Heider, K *Vergleichende Entwicklungsgeschichte der*  
*Tiere*  
Jena, Fischer, 1936, 2 v
- Mairano, M *Le varici e l'ulcera varicosa, moderni metodi di cura*  
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- Osgood, E E & Ashworth, C M *Atlas of hematology*  
San Francisco, Stacey, [1937], 255 p
- Parodi, F *Il medico pratico di fronte alla tubercolosi polmonare*  
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- Roholm, K *Fluorine intoxication*  
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- Rolleston, J D *The history of the acute exanthemata*  
London, Heinemann, 1937, 114 p
- Rongy, A J *Safely through childbirth*  
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- Salzmann, J A *Principles and practice of public health dentistry*  
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- Sands, I J *Nervous and mental diseases for nurses* 3 ed  
Phil, Saunders, 1937, 321 p
- Scherf, D *Lehrbuch der Elektrokardiographie*  
Wien, Springer, 1937, 241 p
- Schindler, R *Gastroscopy*  
Chic, Univ of Chic Press, [1937], 343 p

SECTION OF ORTHOPEDIC SURGERY—October 15

- I EXECUTIVE SESSION—a Reading of the minutes
- II PAPERS OF THE EVENING—a The decline in incidence of tuberculosis of bones and joints Benjamin P Farrell Everett M George (by invitation) b A comparative study of the operative and the non operative treatment for Pott's disease in children Leo Mayer, Harry Finkelstein Samuel Jahss (by invitation), Benjamin Greenberg (by invitation) c The treatment of tuberculosis of the spine by spine fusion Walker E Swift d Discussion, Benjamin P Farrell Alan DeForest Smith Mather Cleveland

SECTION OF OPHTHALMOLOGY—October 18

- I INSTRUCTIONAL HOUR (7 00 to 8 00)—The orbit John E Virden
- II SLIT LAMP DEMONSTRATION—Milton L Berliner Wendell L Hughes Girolamo Bonaccolto Gordon M Bruce
- III READING OF THE MINUTES (8 30)
- IV PRESENTATION OF CASES—a Results of corneal transplants Ramon Castroviejo b Melanosarcoma Bernard Fread (by invitation) c Optic nerve lesions Frank D Carroll (by invitation) d Mixed tumor of the lachrymal gland Richard T Paton
- V PAPER OF THE EVENING—Adie's syndrome Foster Kennedy Herman Wortis (by invitation) John Reichardt (by invitation) Baxter B Sair (by invitation) Discussion John M Wheeler Webb Weeks

SECTION OF MEDICINE—October 19

- I READING OF THE MINUTES
- II PAPERS OF THE EVENING—a Mandelic acid therapy in urinary infection Meredith F Campbell Discussion George Baehr b The use of sulfanilamide (para amino sulfonamide) or its derivatives in the prophylaxis and treatment of certain bacterial infections Perrin H Long Baltimore (by invitation) Discussion Homer F Swift Josephine B Neal
- III GENERAL DISCUSSION

SECTION OF GENITO URINARY SURGERY—October 20

- I READING OF THE MINUTES
- II PAPERS OF THE EVENING—a The use of mandelic acid in infections of the genito urinary tract Grayson Carroll St Louis (by invitation) b The use of sulfanilamide in infections of the genito urinary tract Frederick A Reuter Washington (by invitation)
- III DISCUSSION—J A C Colston Baltimore (by invitation) Nathaniel Rathbun Oswald S Lowsley Clarence Bandler

SECTION OF OBSTETRICS AND GYNECOLOGY—October 26

*From the Obstetrical and Gynecological Services of Harlem Hospital*

- I CASE REPORT—Twin ectopic pregnancy (two cases) George Blinick
- II PAPERS OF THE EVENING—a A clinico pathological classification of infected abortion Harold B Davidson Discussion William E Studdiford b Treatment of late abdominal pregnancy Abraham C Posner Discussion C F Jellinghaus c A new simple operative treatment for recurrent salpingitis (gonorrheal) Henry C Falk Discussion Frederick C Holden
- III GENERAL DISCUSSION

AFFILIATED SOCIETIES

NEW YORK ROENTGEN SOCIETY in affiliation with THE NEW YORK ACADEMY OF MEDICINE

October 18

- I PRESENTATION OF INTERESTING CASES

II CLINICAL ROENTGEN STUDIES OF THE SMALL INTESTINE—a Neoplasms Paul C Swenson b Infections deficiency states etc Ross Golden

III DISCUSSION OPENED BY A Purdy Stout

IV EXECUTIVE SESSION

NEW YORK MEETING of the SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE—October 20

#### ORDER

- I Glucose reabsorption in the dog kidney in relation to plasma level J A Shannon (by invitation) S Fisher (by invitation)
- II The distribution of material inoculated into the monkey brain M Schaeffer (by invitation) R S Muckenfuss
- III The lysis of *Vibrio comma* by bacteriophage and by immune serum Ward J MacNeal Frances C Fisher (by invitation), Ella Krumwiede (by invitation)
- IV An agent transmissible to mice obtained during a study of pemphigus vulgaris A W Grace F H Susskind (by invitation)
- V Treatment of alcoholic cirrhosis of liver with high vitamin therapy A J Patek (Introduced by W W Palmer)
- VI Toxic effects of vitamin B<sub>1</sub> in rats D Perla

NEW YORK PATHOLOGICAL SOCIETY in affiliation with THE NEW YORK ACADEMY OF MEDICINE

October 28

- I PAPERS OF THE EVENING—a Colostrum cell carcinoma of the breast Andrea Saccone Abraham Rosenthal b Effect of subcutaneous injections of concentrated spleen extracts on mouse sarcoma 180 Richard Lewisohn c Chronic intrahepatic obliterating cholangitis Paul Klempner

II EXECUTIVE SESSION

## DEATHS OF FELLOWS

GROSS, LOUIS 260 Riverside Drive, New York City, born in Montreal, Canada, May 5, 1895, died in Knight, Wyoming, October 17, 1937, graduated in medicine from McGill University in 1916, elected a Resident Fellow of the Academy February 3, 1927

Dr Gross was director of the pathological laboratory of the Mount Sinai Hospital. He was a member of the American Society for Experimental Pathology and the American Association of Pathologists and Bacteriologists.

KINDRED, JOHN JOSEPH 667 Madison Avenue, New York City, born in Southampton County, Virginia, July 15, 1864, died in Astoria, New York, October 23, 1937, graduated in medicine from the Hospital College of Medicine, Louisville, in 1889, elected a Fellow of the Academy January 15, 1920

Dr Kindred was a Fellow of the American Medical Association and a member of the American Psychiatric Association and the County and State Societies. He contributed a number of articles on mental disease.



MEIERHOF, EDWARD LEE 253 West 72 Street, New York City, born in Philadelphia, Pennsylvania, November 24, 1860, died in New York City, October 25, 1937, graduated in medicine from the University of Maryland in 1881, elected a Fellow of the Academy May 3, 1900 Dr Meierhof, who retired from practice ten years ago, was at one time professor of eye diseases at the Baltimore Medical College, and was associated with the Mount Sinai and Sydenham Hospitals and the New York Eye and Ear Infirmary

He was a Fellow of the American College of Surgeons, the American Medical Association and a member of the American Academy of Ophthalmology and Otolaryngology, and the County and State Medical Societies

POLLITZER, SIGMUND 1 West 85 Street, New York City, born in Richmond, County, Staten Island, New York, June 12, 1859, died in New York City, November 1, 1937, received from the College of the City of New York the degrees of Bachelor of Arts in 1879 and Master of Arts in 1882, graduated in medicine from the College of Physicians and Surgeons in 1884, elected a Fellow of the Academy March 5, 1891, designated a Fellow in dermatology and syphilology, 1933, and Chairman of the Section on Dermatology and Syphilology from 1908 to 1910

He was professor of dermatology at the New York Post-Graduate Medical School from 1906 to 1915 He was consulting dermatologist to the Lenox Hill Hospital

Dr Pollitzer held a certificate from the American Board of Dermatology and Syphilology and was a Fellow of the American Medical Association and the American Association for the Advancement of Science He was president of the Alumni Association College of the City of New York in 1923 and a member of the American Dermatological Association and its president from 1914—1915, the American Association of Pathologists and Bacteriologists and the State and County Medical Societies

ROBERTS, PERCY WILLARD 121 East 60 Street, New York City, born in Janesville, Wisconsin, January 10, 1867, died in New York City, November 8, 1937, graduated in medicine from Boston University School of Medicine in 1894, elected a Fellow of the Academy May 5, 1910, designated a Fellow in Orthopedic Surgery in 1933

Dr Roberts was consulting surgeon to the Ruptured and Crippled Hospital and consulting orthopedic surgeon to the St Agnes and White Plains Hospitals

He was a Fellow of the American College of Surgeons, the American Medical Association, and a member of the American Orthopedic Association, the American Academy of Orthopedic Surgeons and the County and State Medical Societies

# BULLETIN OF THE NEW YORK ACADEMY OF MEDICINE

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## THE FACTUAL BACKGROUND FOR THE TREATMENT OF PROGRESSIVE DEAFNESS FROM OTOSCLEROSIS\*

EDMUND PRINCE FOWLER

It is well to preface the presentation of any new or startling surgical procedures with a brief sketch of the factual background against which they must function. I shall now essay such an outline as I see it.

There are many theories and but few, if any, generally accepted opinions as to the etiology of otosclerosis, although the literature on the bone pathology and pathological anatomy is extensive, probably no other cubic millimeter in the human body, certainly no part of the skeleton, has been more extensively explored. In spite of this, we not only are ignorant of the etiology of the peculiar bony changes in the labyrinthine wall, but also of what causes them to cease in various stages of development coincidental with, because of, or in spite of treatment.

The mere fact that bone is involved implicates some abnormal local or general blood or lymph changes, probably in the calcium, phosphorus, or phosphatase, dependent on, caused by, or coincidental with, local circulatory impedences. It may be that the pathogenesis of clinical otosclerosis (ankylosis of the stapes) is predicated upon the prior impedance, or interference with free motion in the labyrinthine windows, due to residues from past inflammatory episodes, supplemented or not by other factors. Such impedance, by interfering with the normal movements of the annular ligament and round window membrane, would alter the local pressure, blood volume and nutrition, the local pH and CO<sub>2</sub>, and in the presence of a

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\* Delivered before the Section of Otolaryngology of The New York Academy of Medicine, October 6, 1937

predilection for—or the actual presence of—a nearby otosclerosis or other bone dyscrasia, would accentuate and give direction to these local conditions, and thus increase the already abnormal states. It is my opinion that the circulation and therefore the normal nutrition of the areas of predilection for otosclerosis are affected by any long continued diminution of motion in the membranes of the oval and round windows, and that any change in the circulation to establish a new vascular adjustment is in itself a potential threat to normal osteo metabolism. These suggestions are made more attractive by the fact that although one out of twenty adult autopsies disclose the presence of otosclerosis, less than a quarter of these show symptoms of impendence in the labyrinth windows. If more carefully examined, I am sure a larger percentage would show defective hearing, but, even so, it is clear that otosclerosis does not always cause deafness.

There is no convincing evidence that any medical or surgical treatment has ever resolved or removed the lesion of established otosclerosis. There is no way to safely remobilize the stapes, or the oval and round window membranes, once any of these become calcified and immovable in their windows in the labyrinthine wall, and therefore there remain but two possible means to thwart the process. The first is to stop the lesion by medical or surgical treatment before deafness occurs. The second is to circumvent the lesion by surgical techniques, to open a new sound channel into the labyrinth, to reestablish, for sounds received through the air, two movable ports—one for the reception and one for the release of the sound pressure vibrations—so that the basilar membrane can function more normally. If the oval and round windows are both completely ossified, it will be necessary to construct two new ports into the labyrinth, one into each scala. If only the oval window is ossified, it will be necessary to construct but one port into the labyrinth and this must be made into some portion which connects with the membranous ducts leading to the scala vestibuli. For sounds received through the cranial bones only one port

is necessary for perfect hearing, because the pressures are received by the labyrinthine fluids through the squeeze of the cochlea wall. No second open port of entry is necessary.

The diagnosis of even uncomplicated otosclerosis is not always easy, and the diagnosis of otosclerosis complicated by other lesions, as it generally is, is often very difficult, but a careful otologic examination will give a correct answer in eight out of ten instances after deafness has been detected. There is no sure way of making a diagnosis except at autopsy.

A greater and unsurmountable difficulty has always been the lack of any means of detecting otosclerosis before deafness comes on. If this could be done, it would be possible to subject each patient to treatment, and a preventive or corrective method of choice would in time evolve. I have recently reported some clinical experiments which suggest a logical approach to this problem, and which give some promise of a successful solution.\*

The failure to discover abnormalities in the blood and tissue juices of otosclerotics does not mean that abnormalities have not been present. It may mean that they are too small or variable to be detected by the means now available, or that our search has been instituted so long after the cause has disappeared that all signs of their presence have been removed or become masked by subsequent lesions. In any event, in established otosclerosis the blood and tissues, other than the lesion itself, appear to be similar to those in otherwise healthy persons.†

Methods for overcoming these defects in clinical and laboratory research have been suggested, but all are difficult to put into operation. One measure I am advocating as a routine is that all otosclerotic families submit their children to careful and regularly repeated examinations, preferably some years before the critical ages for the onset

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\* E. P. F. A Method for the Early Detection of Otosclerosis. A Study of Sounds Well Above Threshold. *Archives of Otolaryngology*, Vol. 24, pp. 731-741, December, 1936.

† Fowler, E. P. Calcium, Phosphorus and Cholesterol in Otosclerosis. *Arch. Otol.*, Jan., 1931, Vol. 13, p. 77-83. *Trans. Am. Otol. Soc.*, 1930.

of otosclerosis, that is to say, some time before deafness from otosclerosis is most frequently recognized, and several years before puberty, child bearing and the menopause. There is no other way to clinically study or diagnose early otosclerosis and there is no better time to institute a study of preventive measures.

Because of the fact that the hearing of those suffering from otosclerotic deafness, like the hearing of other humans, varies from day to day, from hour to hour, and even from minute to minute, with the weather, the attention and mental states, and with changes in other lesions and conditions coincidental with or contributory to the otosclerosis, many treatments and so-called cures have been given credit for beneficial effects on the otosclerosis. *None of these have diminished the otosclerosis or the deafness caused by the otosclerosis.* This does not mean that proper treatment cannot improve the hearing in spite of the permanence of the bony lesion, because as I have shown, otosclerosis is more regularly accompanied by other lesions contributing to the deafness than is realized, and some of these lesions are amenable to treatment\*. The otologist should do his utmost to discover and diagnose these lesions and utilize every device useful for their amelioration. He should not delude himself or his patients by believing that such improvements have been due to any effect on the otosclerosis. He should not by catheterization and over inflation, by so called finger surgery of the Eustachian tube, or in any other way injure the patient. Many otosclerotics show stretched drums, extensive scars and adhesions from practices such as these. Their condition has been made worse by unwarranted and unscientific treatments.

In addition to, or in the absence of non-surgical treatment, hearing aids and lip reading are of great service, and imperative if the deafness becomes marked for speech (over 40 db loss), but many people are so deaf that no hearing device is of much service, and these people have in the past had no hope of ever hearing again.

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\* Fowler, E. P. Otosclerosis Complicated by Other Lesions. *Annals of Otol, Rhin & Laryn*, Sept., 1933, Vol 42, No 3, p 714

Recently this picture of hopelessness has been changed. There is in process of development an operative procedure which has proved successful in certain selected cases of otosclerosis. The deafened have been actually made to hear again. A seeming miracle has taken place, but, as scientists, we must proceed cautiously with these new operative procedures, because they have not been generally accepted as satisfactory. In fact, they are not always satisfactory. In unskilled hands they may prove useless, very distressing, or dangerous. This is particularly true of the intracranial techniques. They may destroy even the little hearing the patient possessed. They may destroy life.

There is no reason to believe that these operations can directly lessen nerve deafness, but I have observed cases showing marked loss of bone conduction (the usually accepted criterion of neural lesions) and very severe deafness from otosclerosis which may be greatly benefited, because these are the cases with both the oval and the round windows completely ossified\*. These are the cases that often say they are totally deaf, they believe they cannot hear anything before operation and may think they hear perfectly after operation. They do not hear perfectly. They do hear much more than they did before.

Deafened people are so anxious to grasp at any hope of relief and so insistent that something drastic be done that it is sometimes difficult for the surgeon to dissuade them, even though operation is not indicated. This, however, he must often do.

There is no doubt in my mind that in a large proportion of cases properly selected and treated, many people have experienced marked improvement from these operations for various lengths of time.

One of the chief obstacles to the acceptance of the operative procedures has been the use of functional hearing tests of doubtful accuracy or completeness, by air conduction and bone conduction. There has been doubt as to just how much change has taken place because of the opera-

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\* Fowler, E. P. Localization in the Cochlea. *Annals of O. R. & L.*, Sept 1935, Vol 44, No 3, p 89.

tion, just how much the improvement is due to the mechanical effects of the operation and how much to the psychological effects of the operation. The carrying out of accurate hearing tests is complicated by the fact that in marked binaural obstructive deafness it is difficult to avoid crossed audition both for the test frequencies and for the noise used to mask the opposite ear. It is often difficult to eliminate the hearing of the opposite ear and yet obtain a true picture of the hearing in the ear being tested. For any improvement in the hearing to be convincing, all these difficulties must have been kept in mind and largely overcome in the methods used both before the operations and at various periods following the operations.

One of the pioneers in the surgical methods for lessening the deafness of otosclerosis is Prof. Maurice Sourdille, of Nantes, France. For twelve or thirteen years he has persisted and finally perfected his techniques in middle ear and labyrinthine surgery to a point where he feels warranted in making certain definite announcements. Dr. Sourdille, after serving as interne and then resident in surgery and as assistant to the otolaryngologist, Dr. Ler moyez, saw four years of service in the World War as the head of a surgical unit in the army of France. He was awarded the Croix de Guerre. In The New York Academy of Medicine library may be found practically all the contributions of Dr. Sourdille, beginning with a thesis on "Aural Surgery" written in 1914-15, and a volume on "War Otitis" and "War Deafness," written in collaboration with Dr. Bourgeois, otorhinolaryngologist to the Paris hospitals. This was translated into English by J. Dundas Grant. In 1926, becoming interested in Bárány's research on the semi-circular canals of dogs, and Holmgren's clinical application of Bárány's findings, he attempted to verify clinically and amplify the results of these experimentors. Slowly a new surgical technique was evolved and the successive developments published in the medical press of Europe and America. Recently an extensive monograph was published on his chosen subject.

# NEW TECHNIQUE IN THE SURGICAL TREATMENT OF SEVERE AND PROGRESSIVE DEAFNESS FROM OTOSCLEROSIS\*

MAURICE SOURDILLE

Professeur a l'Ecole de Médecine de Nantes, France

In beginning this address, I should like first of all to express my gratitude to Dr Fowler for the honor of being asked by him to give you my opinion on one of the most difficult and arduous problems in our specialty. I should also like to express to him, and all of you, who saw service in France, my great appreciation for the sympathy that was shown to the Country to which you came to succour in a time of great distress. You abandoned your firesides, your occupations and your interests, that is a thing which a Frenchman cannot forget, and that he likes to recall.

I wish also associated with this great honor to me, the names of some of the masters to whom I am indebted for what I have been able to do. Lermoyez and Henri Bourgeois, of Paris, for general culture, and to Professors Bárány of Upsala and Gunnar Holmgren of Stockholm for the particular question that brings us together tonight. The surgical treatment of otosclerosis.

I regret very much not having enough command of your language to go as much into the details as I should like to in discussing such a subject. I am sure you will excuse the way my subject is presented and take away only the point of what is said, not how it is said.

The surgical treatment of otosclerosis, begun twenty-five years ago by Professor Bárány, Doctor Jenkins and Professor Holmgren, has received in the past ten years such an impetus that it has become one of the most captivating subjects in contemporary otology, but also one of the most complex. It is not possible to treat it completely in a few moments. Besides, the late Dr. Ducloux and Dr.

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\* Delivered before the Section of Otolaryngology of The New York Academy of Medicine, October 6, 1937



Fowler have set forth the general state of the whole question in the recently published third volume on otosclerosis. I wish therefore, this evening, after a rapid tour of the horizons, to show you more particularly my personal experiences, what seems to me to be to the point—what it is already possible to do.

In a general way, it is possible to group the operative procedures by various authors, who have tackled this question, into two large groups. The first comprises the procedures which have been inspired by the presumed pathogenesis of otosclerosis. They propose to attack the disease at its root and the operations are performed outside of, or even far from the ear. These are

- 1 The operation of Wittmaack-Heyninz-Rollin, designed to combat the perilabyrinthine venous stasis. This operation may be called "elevation of the supra-tympanic dura mater." I hope that Dr. Fowler, Jr., who has just returned from Hamburg, will tell you something about it later.

- 2 The operation of Alonso Chiarino, which consists in removing one parathyroid or suppressing its function by ligature of its principal vessels. The operation is recent and we cannot yet judge the results.

In every way these operations with a pathogenetic inspiration are designed with one purpose in mind: the arresting of the progress of the disease. But, supposing this final purpose obtained, it is not wholly a question of making the disease retrocede, nor of recovering a too deficient audition. They are therefore indicated only at the very beginning of the sickness and once the cases have passed the early stages, they should be put in the second category.

The second class of operation, comprising those which are properly auricular, attack the local functional troubles. They are based on the acoustic results produced by fenestration of the labyrinth. These are by far the most numerous. They are the newest and most fertile and give promise of being a definite triumph. It is these which I shall discuss for the rest of this conference.

## I OPERATIONS BASED ON FENESTRATION OF THE LABYRINTH

### *Historical*

With what we know today, it is easy to understand why the first tentative surgical procedures which took place in the last century could not succeed—in particular those used towards 1890, the extraction of the stapes or the operation of Kessel. Here are two cases of the common lesions of otosclerosis. The footplate of the stapes is so fixed by an osseous process and its crura so wedged in by the borders of the deformed oval window that extraction of the ossicle is practically impossible. If one exerts traction on the crura they are certain to be fractured and there is no other way of raising the footplate. Besides, be assured that even if this could be done, the large communication established between the hole opened by the ablatum of the tympanus and the labyrinth will permit infection to enter and will thus lead to inevitable total deafness. It was this simple conception which led in 1900 to an official condemnation of the operation which was so severe that we are still influenced by it.

When Bárány, in 1910, proposed the opening of the posterior semi circular canal he had a double purpose.

- 1 Acoustic to create a labyrinthine window which would compensate for the suppressed resonant waves, from which he hoped that the round window would then take over the function of the non-utilizable oval window.

- 2 Surgical to avoid the opening of the mastoid cells and so avoid the mastoid infection and the secondary labyrinthitis, so much to be feared.

An immediate result was obtained—the return of audition on the operating table, but the result was ephemeral, for, a few days after the operation, the increase in hearing disappeared.

Doctor Jenkins and Professor Holmgren in opening the external and superior semi circular canals had the same experience.

Since the gain in hearing appeared with the opening of the labyrinth, one can easily deduce that its disappearance

was due to a bony closure of the labyrinthine fistula. For fifteen years these authors tried to combat this bony closure of the fistula, they tried soft tissue, they used fat grafts. They used connective tissue grafts with and without prostheses. They used gutta percha.

On the other hand, each of these surgical procedures was attended by more or less complete or conservative radical operations. There was the greatest chance of a surrounding infection, extremely difficult to control, and often connecting with the labyrinth so as to destroy it.

So Bárány and Holmgren adopted the mastoid operation without opening of the external auditory meatus and with immediate closure of the retro auricular wound.

When, in October 1924, I was introduced to this type of surgery by Prof. Holmgren, I quickly saw that there were two problems to be attacked: the acoustic and the surgical. But if the solution of the two problems was indispensable to obtain a result, the order of the researches was not an indifferent matter. I believe that in order to solve the acoustic problem, it was necessary to determine the mechanism of the return of hearing as well as finding the way of conserving it. The surgical problems would naturally follow and adapt themselves to the physiological conditions required. Experimentation has finally proved that there was a concordance with the pathological problem.

On these bases I created surgical procedures which I named "tympano labyrinthopexy". They consist in associating the opening of the external semi-circular canal to the new tympanic system derived from the normal system. For the last ten years I have remained faithful to this principle, all my efforts, with the collaboration of my Assistant, Dr. André Loué, have been bent towards the realization of its technique. Two of my friends, Doctor Ledoux of Brussels and Dr. Tato of Buenos Aires, have been kind enough to follow me in this path. More recently, in 1936, Professor Holmgren has brought an important modification in his procedures, on the principle of his en-

domastoid operation, consisting in the simultaneous opening of two or three semi circular canals and the application of a gold leaf between the labyrinthine fistula and the membranous cover

In order to judge the value of these different procedures, let us study more in detail the problems to which they give birth

## II THE ACOUSTIC PROBLEM

### A *The mechanism of the return of hearing at the moment of the opening of the labyrinth*

From the opening of the semi-circular canal, that is, the perilymphatic space, *there is an outflow of perilymph*. Presently, but only after the passing of a moment, the hearing increases. Why? Professor Holmgren has said, "it is the decompression which does this," but what does he mean by that? Since the semi-circular canals are at different levels, on opening them, all the spaces above the level of the labyrinthine fistula *become empty*. Of course, the pressure is diminished. But in my opinion there is something else much more important. There is formed in the labyrinth *a free surface of perilymph*. The mobilization of this perilymph is therefore considerably augmented under the influence of a sound wave at the level of the opening of the labyrinth, not only by air conduction but also by bone conduction from the entire cranial vault.

It is then the *half emptiness* of the perilymphatic space with the resultant very great mobility of the perilymph which is the cause of the increase in hearing. This is what I called at Norwich, England, "*the mechanism of the half-filled flask*."

It is in fact easy to reproduce this phenomenon with the aid of two flasks placed upon a table. One is full of water with its cork indicator submerged, and closed by a cork. The other is half full, but with the same cork indicator. The least shock given to the table puts the indicator of the half filled flask in vibration, while that of the completely filled flask rests immobile.

How is sound energy transmitted to the perilymph? At the same time, both by the direct influence on perilymph at the level of the labyrinthine fistula which is exposed to the exterior air and by bone conduction from

the cranium Because it is manifest that if the labyrinth being open, on suturing the posterior mastoid wound and on closing the external auditory meatus with wax or paraffin, the auditory gain is diminished but the hearing still remains better than it was before the creation of the labyrinthine fistula Also in the first hours that follow the opening of the labyrinth, the Weber is often lateralized to the side of the open labyrinth which indicates that the bone conduction has been increased on that side

This mobility of the perilymph is still greater in the case of multiple simultaneous opening of either two, or even three semi-circular canals, as has been recently performed by Professor Holmgren He has stated that at each new opening of a canal there is a corresponding increase in hearing which permits the patient to hear ten, fifteen or twenty times the distance that he could hear before the operation

### *B Mechanism for the conservation of the improved hearing*

The first idea which comes to mind will be to conserve indefinitely this state of semi-vacuity of the labyrinth But for that, it would be necessary to produce a *continual outflow* of perilymph in a quantity just equal to its relatively rapid rate of secretion

Practically, the least membrane that one places on the labyrinthine fistula—a piece of connective tissue—the slightest clot of blood adheres rapidly to the bony edges and prevents the escape of the perilymph The *labyrinth refills*, the pressure increases and the mobility of the perilymph diminishes, so does the increase in hearing While the membrane over the opening remains thin, supple and easily depressable, the hearing continues to remain considerably increased, if this membrane becomes thickened or ossified, all the gain disappears

But experience has shown that even with a refilled labyrinth *it is still possible to produce hearing by mobilizing the perilymph of this refilled labyrinth* We are going to see how

## III THE SURGICAL PROBLEM

The surgical problem presents itself under two headings

1 By what mechanism can the mobilization of the perilymph be conserved in a durable way?

2 Can this hearing mechanism be practically produced surgically?

*Hearing mechanism*

a *The continual escape of perilymph* seems to have been produced recently by Holmgren who placed a piece of gold foil over the labyrinthine fistula. The gold foil prevented the adherence of a fat graft to bony edges of fistula. Between the gold foil and the bone the perilymph could filter out. Evidently the adherence of the fat graft to the edges of the gold foil puts off the problem rather than solves it.

b *The direct mobilization of the perilymph of a filled labyrinth* is possible. It is sufficient to place on the labyrinthine fistula, either directly or else with interposition of thin cushions of fat or connective tissue, a prosthesis of a certain weight, a foreign body such as a piece of gutta percha (Barány, Holmgren). These masses in contact with the bony walls of the mastoid receive sound vibrations by bone conduction and are displaced by them. This movement induced at the level of the labyrinthine fistula produces little shocks which hit the perilymph and set it in motion. This is what I have called *the mechanism of the bell*.

c *The indirect mobilization of the perilymph in a filled labyrinth can be produced by mobilization of the membrane covering the labyrinthine fistula by means of a reconstructed tympanic system.* This is the method which I have personally devised and have been using for the past ten years. I have given it the name "tympano labyrinthopexy." It consists in joining the covering membranes of the labyrinthine fistula with the superior border of the membrana tympani whose excursions have been increased by the resection of the head of the malleus.

The incus preserved in its high position plays the rôle of a mobile prop and permits the displacement *en masse* of the entire system. The proof that this is the correct interpretation lies in the fact that immobilization of the incus or adherence of the flap between the drum and the labyrinthine fistula no longer permits the conservation of the hearing, which has been observed to be increased at the

operating table I have tried to demonstrate this with a stroboscope So far I have had no success, however

#### IV SURGICAL RESULTS OF THESE DIVERSE PROCEDURES

A In the two first procedures, utilizing the gold foil and prosthesis with gutta percha, the operation can be done simply enough in one sitting by the *endo-mastoid route* with immediate closure of the post-auricular wound One thus avoids the danger of infection and recovery can be rapid, normally fifteen or twenty days But against these advantages of which the most evident is the speed of recovery, one must put these inconveniences

1 What is the value of the surgical result for this type of auditory mechanism?

I believe that I can truthfully say that the essential purpose of the prosthesis has always been, in the words of its authors, to prevent the closure of the bony fistula Their action I believe to be very feeble Actually the closure of the fistula is easier in these cases than without prosthesis

I have already explained that actually the rôle of the prosthesis is not to keep the fistula open but to produce an auditory mechanism of its own Unhappily this is the weak point of the procedure The mechanism is artificial and very delicate The secondary immobilization of the prosthesis or its isolation from bone by masses of granulation tissue, connective tissue grafts, or fibrous tissue, often supervenes and destroys rather rapidly its good effects

2 After the mastoid wound is closed we no longer have any external control of the labyrinthine fistula or of the function of the prosthesis If re intervention is necessary, it must be done blindly and whatever modification or re-touching is done, the same conditions return and again there is no progress

3 Finally there remains the great uncertainty of the tolerance for a foreign body of an exact weight and an exact surface placed in contact with bone at the bottom

of a mastoid susceptible to direct infection in the course of the operation or later by way of the Eustachian tube and middle ear

Besides, even in fracture repairs such foreign bodies produce such serious accidents that secondary ablations of them are often necessary. There are those who believe a foreign body may increase the susceptibility to infection of the labyrinth and through the labyrinth the meninges. B The tympano labyrinthopexy has against it its complicated appearance and the difficulties of its realization

Against it is to be noted

1 It cannot be done in a single operation. It is necessary to have two or, better, three successive operations and frequently the third stage must be repeated in order to obtain a permanent labyrinthine fistula with a maximum effect

2 It is an *extra mastoid* operation, that is to say, it puts the interior of the mastoid cavity in communication with the cavity of the external auditory canal and so makes it susceptible to an external otitis. It is necessary to accept this risk, but at a moment when there is no danger to the labyrinth, with careful aseptic technique, this stumbling block can usually be avoided and in any case can be surmounted before the opening of the labyrinth

Of its advantages we can say

1 In case the transformation of the tympanic system is successfully carried out, its function is definitely assured without the possible variation of the type seen with the prosthesis

2 The tympanic system and the labyrinthine fistula are constantly in sight and can be tested with a manometer or any other imaginable apparatus of control. This is very important

3 With the tympano labyrinthopexy, the opening of a *single canal* (the horizontal, the most easy of access) produces a considerable amelioration of the auditory malfunction, from forty to fifty times or more the distance of the preoperative hearing. With the prosthesis procedures,



in order to get the best results it is necessary to open several semi-circular canals This is one of the greatest objections that one could possibly make to operations in this category Wounding of the membranous canal is one of the greatest dangers that one faces in the curing of deafness The more osseous canals that are opened, the more the risk of injuring the membranous canals It is better to concentrate on the less delicate manoeuvres on the tympanic system than on the labyrinth, which is so very fragile

4 Biologically it is unnecessary to add any foreign body to the organism with the consequent danger of intolerance, or of labyrinthine suppuration and its propagation to the meninges

5 Each difficulty is attacked separately and the results proved before passing to the next

6 Touching up the operation is easy and is directed exactly at the point at fault Most often it is the labyrinthine fistula which is closed by an osseous callus Now the formation of this callus is the result of two elements the ossification of the endosteum and the proliferation of the osseous surface Practically it is very difficult in a single opening to raise the endosteum completely and prevent proliferation of the osseous surface But if one lifts up this new-formed osseous lamella, one elevates at the same time both the ossified endosteum, and the osseous surface, cut in the callus, has less tendency to proliferate Experience has shown that in most cases, the results are definite after this second opening of the labyrinth

It is because of these advantages that I remain constantly faithful to this procedure, the nearest approach to the natural mechanisms of hearing I prefer to adopt the most normal, the most sure and the least dangerous mechanisms, whatever the difficulties, even if certain material inconveniences have to be borne, to which conditions the surgical technique must submit The three primary considerations are the safety of the patients, the regularity, and the quality of the end-results

## V THE PATHOLOGIC PROBLEM

It is now an undeniably observed fact that a local surgical treatment is sufficient to re establish hearing and to conserve it without change for several years, as long as the necessary conditions expressed above are adhered to. Doubts expressed on the durability of the results and the cessation of the evolution of the disease are no longer valid after eight years of observation.

How then can we make these results accord with the diverse known pathologic conceptions which are still in favor? Far be it from me to think of minimizing the importance of these histologic considerations. But alone they do not constitute the whole malady. There are perhaps elements that the microscope cannot show. It is necessary also, according to the ideas of Professor Leriche, to use the aids of clinical and operative physiology. Tympano labyrinthopexy permits this being done.

It seems well established that the known osseous lesions do not act directly on the auditory elements but probably through the intermediary of the liquid media of the ear, in particular modifications of the perilymph.

Objectively any durable and permanent decompression of the perilymph suffices to arrest the progression of the deafness. What difference does the method make if the functional result is obtained? In our uncertainty, nothing can prevail against undeniably observed facts. But in order to improve the hearing, something more is necessary to reestablish the mobility of the perilymph by one of the described mechanisms.

In the present state of our knowledge, at least of mine, the procedures most direct and best worked out, and the one on which we have the most experimental data, is tympano labyrinthopexy—the reconstruction of a secondary tympanic system associated to one labyrinthine fenestra. These two structures complete each other and are inseparable.

### *Operative Indications*

Here it is necessary to consider three groups of facts (1) *Nature and degree of the deafness*, (2) *Indications of primary otospongiosis*, hereditary or not, without middle ear inflammation but with fixation of the stapes which is diagnosed by the following acoustic methods (a) raising of the lower tone limit from 32 to 128 double vibrations, (b) Rinne negative, (c) Schwabach prolonged, (d) Conservation of a certain degree of labyrinthine sensibility manifested by an audition consisting of between 50 cm of whispered voice and 50 cm of shouted voice with the opposite ear masked during the testing of the shouted voice

Absolute deafness, or almost absolute, ought to be considered a contra-indication if one is going to conserve for this operative procedure its demonstrative value. However, I have found in some of these cases 30 to 40 cm or perhaps one meter audition for the loud voice on opening of the labyrinth, particularly in young subjects, and when the bone conduction values are below normal. But if the Schwabach is much diminished there can be no perception of sound. In the first case, the advantage is considerable since the patient can again converse directly for short distances and indirectly, with a hearing aid for considerable distances. One should therefore not exclude these patients from a chance of recovery. They would choose it themselves.

### CONTRA-INDICATIONS

#### 1 *Local Anatomical Indications*

External auditory meatus wide and straight. Middle ear of large dimensions, well vascularized and resistant.

Medium pneumatization of the mastoid and preferably the wall of the zygoma should not pass beyond a vertical plane through the posterior border of the condyle of the mandible.

#### 2 *Secondary Otospongiosis*

That is to say, progressive deafness with the same acoustic formulae that has been accompanied by inflammatory

alterations in the middle ear, either recently or in the past, characterized by redness of the drum or the handle of the malleus, deformation of the membrane, heavy adhesions, old or recent perforations, open or closed by a thin cicatrix. The inflammatory element starts up again after section of the head of the malleus, the lesions on the articular surfaces of the cartilage of the incus which necessitates the secondary ablation of this ossicle. Any damage of the tympanic substance or cicatrix can destroy the internal plastic flap with subsequent suppuration and necrosis of the incus.

### 3 *Poor General Health and Unsuitable Ages*

One can operate on patients between eighteen and fifty-five years of age. Younger patients are hard to manage and operation under local anesthesia is rendered impossible, as well as the postoperative dressing, by the turbulence and incooperation of the patient. Patients over the age of fifty-five tolerate the necessary analgesics and hemostats such as morphine, scopolamine, ephedrine, adrenalin with difficulty. Cardiovascular disorders are exacerbated by opening the labyrinth. But even before the age of fifty-five, obesity, alcoholism, cardiovascular, pulmonary, hepatic or renal afflictions are all absolute contra-indications for this type of surgery. All candidates for the operation should have a general complete physical and clinical examination.

### 4 *Local Anatomical Contra-Indications*

Narrow external auditory meatus—a crooked or flattened meatus. The length of the flap will be insufficient to close the attic and the aditus with subsequent danger of infection and suppuration of the middle ear.

Too extensive pneumatization of the mastoid, of the squamous portion of the temporal bone and especially of the root of the zygomatica. All these cells must be opened and scraped of this epithelium to avoid secondary suppuration or one will have considerable bony destruction.

*It is absolutely necessary before deciding on an intervention to take a stereoscopic radiogram of the ear in question and to interpret the films correctly* For the last two years all my patients have been systematically X-rayed stereoscopically by Doctors Dano and Lane Their precise technique has furnished very interesting radiograms and has permitted me to fix the operative indications with exactitude

### OPERATIVE TECHNIQUE

Tympano labyrinthopexy is performed in three principal stages separated by intervals of about four or five months

The first two stages are devoted to the transformation of the tympanic system and the thorough modifications of the mastoid region

The third stage consists in the establishment of the labyrinthine fistula at the level of the new tympanic system

The operation is conducted in the following fashion

#### *First Stage*

This is performed entirely within the external canal It consists of lifting the soft parts, thick cutaneous soft parts, fibrous bands and periosteum of the posterosuperior demicircumference of two-thirds of the external auditory meatus This is done through a postauricular incision or even by the external auditory meatus if it is sufficiently wide

The post operative care consists in obtaining on the surface from which the periosteum has been removed, a supple cicatrix, but resistant, without sebaceous glands It takes six or eight weeks for this cicatrization to be complete

#### *Second Stage*

This is done almost entirely in the middle ear, making an incision through the previous post auricular scar One first separates the thin cicatrix made at the first operation from the post-superior canal wall This cicatrix consists of new skin and scar tissue as well as the upper border of the drum I have given it the name "internal plastic"

Then one resects the mastoid, opens the aditus and attic so as completely to exenterate the cell structure and show up the body of the incus and the head of the malleus. The joint which joins these two bones is opened and the two ossicles separated. Using a specially constructed snare, the head of the malleus is resected, care being taken not to puncture the membrana tympani or displace the incus, which should stay in high position and conserve its posterior and inferior articulations. The internal plastic (prepared flap) is then elevated and its bleeding surface applied to the incus, its internal surface to the attic, the aditus and even the antrum. The middle ear is thus hermetically sealed in its superior portion. One ends by covering the lower part of the mastoid with an external plastic made up of scraps of skin and muscle elevated from the inferior surface of the mastoid.

When, after epidermatization of the operative cavity (which in such cases as in wounds of radical operation usually takes six or eight weeks) one examines the transformed ear through the external auditory meatus, one finds that the external canal is considerably increased in size and communicates directly with the mastoid cavity. This large vestibule communicates *behind* on the curve of the horizontal semi-circular canal covered with a more or less thin cicatricial pedicle in front. It communicates with the modified tympanic system consisting now of the drum and the internal plastic which is continuous with its superior half circumference. This internal plastic over the incus, mobile on its posterior and inferior supports ends on the surface of the horizontal semi-circular canal, which is just below and behind the incus.

#### *Third or Labyrinthine Stage*

This consists in lifting up the endo-mastoid flap at the level of the external semi-circular canal, which is opened with great caution, so as not to injure the membranous canal. As soon as this opening is obtained, the increase in hearing seems considerable, ten, twenty times and even

more the pre operative hearing distance. The cicatricial endomastoid flap produced at this level is put in place, consisting of the internal plastic, lowered from the superior border of the incus, which will from now on cover the labyrinthine fistula.

The hearing which ordinarily decreases in the days following the operation, increases as soon as cicatrization has taken place, and attains or even surpasses the hearing observed on the operating table, the moment the labyrinth is opened. It is now easy to observe with a manometer that a feeble air-pressure—from 2 to 10 cm. of water—in the external ear, determines a very definite horizontal nystagmus, at the same time the patient feels a more or less intense sensation of vertigo. Furthermore, one can observe with the tuning-fork the return of aerial hearing of low sounds (64 and even 32 double vibrations), the Weber is changed, lateralized from now on to the non-operated side, and the Rinne can become positive on the operated side while it remains negative on the opposite side.

In a great number of cases, unfortunately, the success is ephemeral. Four, six, or ten weeks later, one sees the aerial hearing diminish, the Rinne becomes negative and the Weber indifferent. At the same time, the air pressure in the meatus can attain 40 and even 60 cm. of water without determining nystagmus, nor a sensation of vertigo. This is due to the fact that the labyrinthine fistula closes, due to the reconstitution of a rigid bony layer, which rarely attains the thickness of the primitive bony wall of the canal, and more often does not exceed a few tenths of a millimeter. It suffices, in a complementary operation, to extract this bony film, to see the hearing gain of the first operation return, and sometimes be even greatly increased. This time the result will be lasting, the regenerating process of the bone becoming gradually exhausted. In many cases, however, I had to open the labyrinth three times.

## RESULTS

In 1935, at the time I published my Report to the Congress of Paris, my statistics were as follows

Patients operated on	109
Number of operations performed	325
Positive results	74 per cent

Composed as follows

Very good results, that is to say, ten times and more previous hearing distance	40 per cent
Good results, five to ten times previous hearing distance	14 per cent
Mediocre results, from two to five times previous hearing distance	20 per cent
Fatalities	None
The number of patients now treated or under treatment exceeds	140
And the number of operations	400

By utilizing my technique, the second method which I have just discussed, and a differential snare for the section of the head of the malleus (a happy modification of my previous snare created by one of my patients, barrister at-law de Rienzi) I am now able to attain 80 per cent positive results, of which 60 per cent are superior by ten times to the pre operative hearing distance

I have had in mind, foremost, the creation of a surgical technique giving very important practical hearing results, and creating an impression on the patient and his immediate relations, but I hope that in the future a precise audiometric measurement will permit us further to improve the method and, especially, its indications and contra-indications

## CONCLUSIONS

The tympano labyrinthopexy permits us to obtain, in cases of deafness from otosclerosis, a fearful and frequent disease, lasting results unknown up to the present time and absolutely comparable to those obtained in ophthal-



mology, in cataiact and glaucoma But, just as for cataract, before the intracapsular extraction of Barraquer, two operations were most often necessary, even so, in otosclerosis, one must, in the majority of cases open the labyrinth twice in order to obtain lasting results We must still work to solve this problem of osteo-genesis, which will diminish not only the unpleasantness of re opening the labyrinth, but one of the causes of grave failure the injury of the membranous canal

But must we, as long as we have not attained this result, consider this operative procedure as still being in an experimental period, and of an exceptional application? I do not believe so During more than half a century, cataracts were operated by a two stage method, before the extraction in a single stage operation The case must be likewise in otosclerosis, as it is well worth doing a complementary operation rather than to leave the labyrinth irre mediably impaired, inasmuch as, the greater the deafness, the poorer the results

The tympano labyrinthopexy is today a precise operation, the fundamental elements of which seem definite—that is, the decompression of the labyrinth and the reconstitution of a tympanic system Personally, I have done these operations for years, I can say daily, at my Private Hospitals in Nantes But we still have a great deal of work to do to adapt our theories to these first results, and to solve the new problems to which they give birth

Gentlemen, I would like to be able to convince you that the moment has come to give to this surgical therapy a very large diffusion, because the number of patients who require this treatment is considerable, perhaps even millions But the importance of the operations that must be performed, the complexity of the technique—in a word, its difficulty and the long and minute post-operative care required—does not permit one to undertake it without long preparation To avoid failure, and the disrepute which has befallen the first attempts in the surgical therapy of deafness, we must envisage three facts

1 *For the otologists* There should be an organization of teams, truly and thoroughly specialized, instructed minutely and during a given length of time, sufficiently numerous to answer a great number of calls and avoid fatigue and hurry

2 *For the patients* It must be possible to hospitalize them the necessary time, in quarters specially chosen for them, far from the neighborhood of other suppurating diseases, acute or chronic, of the ear or the nose, and in a condition of mental and material hygiene that is necessary and suitable for patients who undergo labyrinth operations

3 Lastly, *in order to realize further progress* There must be an organization of laboratories, with adequate quarters and precise acoumetric apparatus

Such a realization would make of otology a highly evolved specialty, perhaps even similar to ophthalmology, which has attained, in such a short space of time, a high degree of perfection. But, as I have said already, in Europe this cannot be the result of isolated efforts. In order to obtain the indispensable help of public and government authorities, one must first of all have the approbation and the moral help of an international committee of otosclerosis, which is the supreme judge in this matter, and the only one qualified to provoke the necessary decisions. I should be especially happy, if, in spite of the gaps and the imperfections of such a long and arid discourse, I have been able this evening to retain your kind attention on the real possibility, the unavoidable necessity, and the profoundly humane character of this great work that remains to be accomplished

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# THE EVALUATION OF THE SURGICAL TREATMENT OF HYPERTENSION\*

GEORGE J. HALLER

It is always difficult and frequently unwise to attempt to evaluate methods of treatment on the basis of insufficient data. The surgical treatment of hypertension must still be considered an experiment in the therapeutics of the disease. The varying manifestations and clinical course of hypertension make it necessary that the results of surgical treatment be studied over a period of years before they properly can be evaluated. It is quite beyond me to predict at the present time the ultimate value of surgical methods. What I can do is to relate our own experience in the treatment of the disease, collect and present the experience of other surgeons as reported in the literature, attempt to correlate the clinical and experimental work which has been done and, from all this, make some guarded statements regarding the surgical treatment of hypertension.

Based upon the supposed relationship between hypertension and certain glands of internal secretion, the sympathetic nervous system and the peripheral vascular system, various surgical procedures have been proposed and used in the treatment of the disease. I shall attempt to present to you all the available data regarding them. I shall omit the treatment of hypertension by radiation of the hypophysis as being outside my present text.

I *The Adrenal Gland, its relationship with hypertension and the therapeutic measures based upon this relationship*. A number of observers have concentrated their attention upon the adrenal gland as a means of attack on hypertension. They conceive of hypertension as the result of hyperfunction of the adrenal glands, the excessive amount of adrenalin excreted into the circulation causing vasoconstriction. I shall not here set forth the evidence

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on which this theory of hyperadrenalinemia is based. It has been summarized admirably by Fishberg, to whom reference may be made by those interested. Clinically the evidence is far from conclusive. Experimentally a relationship between hypertension and excessive adrenal secretion does not yet appear to have been established. Nevertheless, surgeons have attacked the adrenal glands in patients with hypertension and by one of two methods—total denervation of the adrenal glands or subtotal adrenalectomy.

(a) *Total denervation of the adrenal glands.* No one has had an experience with the operation of adrenal denervation comparable to that of Cile. Moreover, in a fairly comprehensive survey of the literature I find but few reports, other than those of Cile, of adrenal denervation for essential hypertension. From the various publications of Cile, the conclusion seems to be justified that total denervation of the adrenal glands for essential hypertension has failed to give satisfactory results. He notes that in cases in which hypertension is accompanied by "nervousness, heart consciousness and tachycardia" these manifestations are often relieved. He also notes that in early essential hypertension in young subjects there is evidence that denervation may stabilize the process, so as perhaps to lessen the percentage of vascular accidents. However, the results of this procedure in the treatment of essential hypertension have been disappointing.

(b) *Subtotal adrenalectomy.* The rationale of this procedure is similar to that in the treatment of exophthalmic goiter. It is assumed that if the subtotal removal of the thyroid gland improves or cures the symptoms of hyperthyroidism through the reduction of thyroid secretion, the subtotal removal of the adrenal gland should, by the reduction of one of its secretions, adrenalin, improve or cure the important symptoms of essential hypertension. A search of the literature has shown twenty-eight cases of evident or presumed essential hypertension treated by subtotal adrenalectomy. The operation has consisted in the partial removal of one gland

the total removal of one gland or the subtotal removal of both glands. Of the twenty-eight cases, twenty-six have been collected and studied by Meillere and Olivier. The results of their studies show that of the twenty-six cases, four died very soon after operation, four failed to show the slightest benefit, nine were improved in "the sense that their subjective symptoms were lessened and their blood pressure reduced, and nine were so greatly improved that the operation was considered a success. The two additional cases which I have found in the literature are considered successful. When I analyze the cases as reported by Meillere and Olivier and add the two cases not included in their report, I find that eleven surgeons operating upon twenty cases had three more or less successful results, and that one surgeon operating upon eight cases had eight successful results. Because of these discrepancies in the results obtained I have consulted the original sources in all reported cases. I cannot here detail this study but I may summarize it as follows:

- 1 Three cases, perhaps, should be excluded from consideration as not pertaining to the problem of essential hypertension. These are the two cases of DeCourcy, the adrenals of which harbored adrenal tumors, and the case of Rowntree and Ball, in which the adrenal was explored but was left untouched.

- 2 Four cases died immediately or soon after operation. These include three unpublished cases of Delbet and one case of Meillere and Olivier.

- 3 Four cases were entirely uninfluenced by subtotal adrenalectomy. These include two cases of Crile and one case each of Stephen and Floercken and Pieri.

- 4 Eleven cases may be considered under the designation "improved." It is evident that the criteria of a successful operation vary in the minds of different observers, some emphasizing the importance of the improvement of the subjective symptoms, others the importance of the reduction in blood pressure. Viewed from these two standpoints, a study of these eleven cases (Crile two,

Meillere and Olivier two, Stephen and Floercken one, Monier Vinaid and Desmarest two, Pieri, Galata, Wilmoth, and Leriche one each) shows that in all there was some relief or improvement in the subjective symptoms, this being very slight to very considerable. In some cases it continued over the period of observation of the patient (usually a matter of months), in some it was temporary and followed by a recurrence of the original symptoms.

Purely from the standpoint of the relief of or the improvement in subjective symptoms, the eleven cases may be said to have been improved, but this relief in hypertensive patients is subject to the most varied environmental changes. An examination of the blood pressure in the eleven cases before and after operation shows that in two cases (Crile, Stephen and Floercken) the blood pressures were not given, in five cases there was no change in the blood pressure or a very slight change (Meillere and Olivier two, Monier Vinaid and Desmarest two, Pieri), in four cases there was a reduction in the blood pressure. Of these, a case of Crile showed a reduction from 200/110 to 160/92 which would only be significant if the measurements were repeatedly performed, the case of Galata, six months after operation showed a fall from 250/130+ to 220/125 which is not significant, the case of Wilmoth, whose preoperative blood pressure was 300/150, showed a blood pressure two years after operation of 230/145, which is hardly significant as no change in the diastolic pressure occurred, and the case of Leriche showed a fall in pressure from 220 systolic to 180 systolic pressure. Since the latter are single measurements and no diastolic pressures are given, the case is of no value. The effect of subtotal adrenalectomy on the blood pressure in the above cases certainly has not been striking.

5 The six cases of DeCoudy (two above have been excluded) are impossible to appraise due to lack of data. In the two cases of essential hypertension without the association of adrenal tumor, in which protocols are given, the subjective symptoms of one were markedly improved and the blood pressure in both was apparently greatly

reduced, though but single preoperative and few post-operative measurements are given. The fact that in one the last blood pressure observation recorded was made only three days after operation and in the other thirteen days after operation, leaves the results indefinite. Later (December, 1935) DeCoucy reports eighteen cases, but again the results obtained are indefinite.

More recently Friedman and Eisenberg have reported a series of seven cases of hypertension treated either by unilateral or bilateral subtotal adrenalectomy. There were two immediate postoperative deaths. The results in the five cases which survived operation were unsatisfactory both from the viewpoint of a reduction in the blood pressure or from the viewpoint of lasting symptomatic relief.

To summarize the relationship between the adrenal gland and essential hypertension it may be said that a study of patients with essential hypertension has failed thus far to show any conclusive evidence that the cause of the disease lies in the adrenal glands, and that experimental work on animals thus far has failed to show a causal relationship. The surgical treatment of hypertension having as its object an attack upon the adrenal glands has thus far proven unsatisfactory. The statement, you will observe, is based upon a study of the results of Crile of denervation of the adrenal glands and of the results of thirty-five cases of hypertension subjected to subtotal adrenalectomy, an experience possibly too small from which to draw final conclusions.

II *Chronic Spasm of the Splanchnic Arterioles, its relationship with hypertension and the therapeutic measures based upon this relationship.* There is evidence of the importance of the vessels of the splanchnic area in maintaining the level of blood pressure. This evidence has been summarized by Page and me in various publications. Briefly, it suggests that the splanchnic vessels constitute an important, but not the only, flexible reservoir which governs the level of arterial pressures, and that in essential hypertension the elevated blood pressure is due in part to constriction or loss of elasticity of the splanchnic

vessels. Interruption of what is believed to be the chief vasoconstrictor nerve supply may, then, and does cause a reduction of arterial blood pressure.

Based upon this proposition, another form of surgical treatment of hypertension includes various operations, the purpose of which is to interrupt the sympathetic control of the splanchnic vessels. These operations include the resection of the splanchnic nerves above or below the diaphragm combined with removal of the lower dorsal or upper lumbar sympathetic ganglia, of the removal of the celiac ganglia, and of the division of the anterior nerve roots of a defined region of the spinal cord. I shall discuss these operations in the order named.

(a) *Supradiaphragmatic resection of the splanchnic nerves combined with lower dorsal ganglionectomy*. Danielopolu, impressed with the importance of the splanchnic nerves in the regulation of arterial pressure, suggested in 1923 the division of the splanchnics for the treatment of hypertension. Bruening and Pendé proposed similar procedures. Pieri approached the splanchnic by a supradiaphragmatic route after resection of the 10th, 11th and 12th ribs. Rossi approached the splanchnics between the attachments of the diaphragm after resection of the transverse processes of the 11th and 12th thoracic vertebrae and, if necessary, of the 12th rib. Pereira, objecting to the technics of Pieri and Rossi because of the danger of injury to the pleura, proposed the section of the splanchnics through a subdiaphragmatic route without resection of any bony structures. Craig, having tried both Pieri's and Rossi's technics and having had develop in one case a serious postoperative pneumothorax, turned to Pereira's proposal and devised an approach below the diaphragm which he employed in his later cases.

In the earlier literature and before the extensive use of the procedure by Peet, I find twelve cases of hypertension treated by this method and have consulted the original articles. In ten cases splanchnicotomy was performed only on one side, in two cases it was bilateral. Avoiding



details, I may summarize the results as follows. Pierré's first case and Durante's two cases are not cases of essential hypertension and may be excluded from consideration. The remaining nine cases suffered from hypertension, although it is not clear that all were cases of essential hypertension. The results obtained certainly were not striking. There was improvement in some cases in the subjective manifestations of the disease but no significant changes in the blood pressure occurred. Peet in this country has been the strong advocate of the supradiaphragmatic resection of the splanchnics. While in earlier literature reports concerned, in the majority of cases, unilateral resection, Peet has insisted upon bilateral resection of the major and lesser splanchnic nerves combined with removal of the lower dorsal sympathetic ganglia. The number of patients upon whom he has performed this operation is large (probably over 100) and when the follow up studies have extended over a sufficiently long period, we should know fairly well what may be expected from this more extensive operation. Thus far the available information regarding Peet's results is as follows. At a meeting of the Clinical Society of Surgery in 1935, Peet stated he had operated upon some sixty cases and gave the results in thirty-nine. Of the thirty-nine cases six, or 15 per cent, showed good results, 43 per cent moderate improvement, 26 per cent slight improvement and 10 per cent no improvement. Two patients died following operation. In January, 1937, in a paper on the effects upon the kidney of bilateral splanchnicotomy in patients with hypertension, he gives the blood pressures of forty-eight patients before and after operation. These patients, the author points out, are not reported to illustrate the effects of splanchnicotomy upon blood pressure in hypertension, and it would therefore be unfair for me to appraise a method from a study of the particular group of cases reported. But his table of cases is of great interest in that it shows the trend with respect to their blood pressure of patients subjected to the operation. In thirty-eight of the forty eight patients, the blood pressure rather

quickly tends to return to its preoperative hypertensive level, in six this tendency is not striking during the period of observation and in four there is no such tendency to date. In twenty one patients the blood pressure returned to or exceeded the preoperative hypertensive level, in twelve it approached but did not rise to the preoperative level and in fifteen it remained well below the preoperative level. In these fifteen, ten have been followed six months or less, one has been followed nine months and four have been followed eleven, sixteen, seventeen and twenty-nine months respectively. The results in these four last cases are good.

Other observers have employed the operation as carried out by Peet. In a series of nine cases of essential hypertension, carefully studied by Page, of which seven were examples of mild benign hypertension in which favorable results were to be anticipated, I performed splanchnic resection combined with lower dorsal ganghionectomy. The results have been disappointing. In all, the blood pressure, reduced as a result of the operation, has, over periods of six months to one year, again risen to or exceeded the preoperative level. The results from the viewpoint of the relief of subjective symptoms also have been minimal. Through correspondence and conversations with surgeons about the country I know that others like myself have employed the operation in small series of cases with disappointing results, others believe they have had encouraging results. It will be seen from this discussion that the ultimate value of this procedure, however, cannot yet definitely be stated, all that can be said from the information we have is that it may prove to have a definite value in a small group of cases.

(b) *Subdiaphragmatic resection of the splanchnic nerves combined with removal of the first and third lumbar sympathetic ganglia and partial removal of the adrenal glands.* The operation as described and performed by Adson consists in the exposure through a lumbar approach of the splanchnic nerves after they have perforated the diaphragm. The nerves between the diaphragm and celiac

ganglia are resected, the resection including a part of the celiac ganglion on either side. The first and second lumbar sympathetic ganglia are removed, as is the outer half of each adrenal gland. The operation is performed on both sides with an intervening interval of ten days. Adson's idea is to interrupt all the sympathetic fibers carrying vasoconstrictor impulses to vessels below the diaphragm just as is accomplished by anterior nerve root section. He is not sure that subtotal resection of the adrenal gland is an essential part of the procedure. The operation was first performed by Adson in February, 1935. In 1936, he reported seven cases treated by this method with five good results and two fair results. Later in the same year (October, 1936), he reported twenty-five cases, without a postoperative fatality. Three cases were not improved but of the remainder which presumably were improved he fails to give details. Still later, in February, 1937, he reports forty-five cases treated by this method, of which thirty-eight had been operated upon a period longer than three months, seven a period less than three months. He reports that of the thirty-eight cases followed more than three months after operation, fourteen have an excellent clinical result, ten a good result, three a fair to poor result, while four have failed to show any improvement. Examined from the viewpoint of a reduction in blood pressure nine show an excellent result, eight a good result, eight a fair to poor result, while six have failed to show any reduction. It will be observed that since this operation was first performed in February, 1935, none of the cases at the time of the latest report had lived more than two years, and the majority had lived less than two years after operation. Adson appreciates this but believes he is justified in expressing the opinion that extensive subdiaphragmatic sympathectomy has been of value in relieving patients of clinical symptoms, and in permanently lowering blood pressure. It seems clear from our own experience that sufficient time has not yet elapsed to state the value of the procedure.

(c) *Celiac ganglionectomy* This more recent operation of Crile consists in the bilateral resection of the celiac ganglion. It involves the division of the major and lesser splanchnic nerves and the interruption of the preaortic sympathetic fibers between the two celiac ganglia. Crile speaks of achieving the denervation of the aorta from the bifurcation to the crus of the diaphragm and states that this is the essential matter in hypertension. Crile, in July, 1936, reported twenty-five cases of malignant hypertension treated by this method but no doubt his series is now much larger. He found that during the operation the blood pressure in cases of malignant hypertension is reduced to the normal level and during the period of hospitalization is more completely stabilized at a lower level than after his former operations. The ultimate results of the procedure cannot at present be stated.

(d) *Rhizotomy or division of the anterior nerve roots of the spinal cord* The operation consists in the division of the anterior nerve roots of the spinal cord from the sixth dorsal to the second lumbar. The purpose is to interrupt all the sympathetic fibers carrying vasoconstrictor impulses to abdominal vessels below the diaphragm. Unlike the peripheral operations of splanchnicotomy, etc., the preganglionic fibers are interrupted rather than the postganglionic rami, but whether this is of any significance is not at present known. The virtue of the procedure to me has been its probable greater certainty of achieving the desired result. As performed by me the operation has been done in two stages, the first stage consisting in a laminectomy with exposure of the dura mater over the area desired, the second stage consisting in the opening of the dura and the division of the nerve roots. The operation is undoubtedly the most formidable, the most time consuming and, in one respect, the most dangerous of the operations for hypertension. Its danger lies in the possibility of an accident to the cord with the appearance of symptoms of a transverse lesion. Adson, in 1936, reported twenty-seven cases treated by this method, with good results in thirteen, fair results in six and no improvement

in six There were two postoperative deaths Page and I have treated twenty-one patients by this method The most elaborate preoperative and follow-up studies have been made in them by Page and the results obtained during the period of study can be stated with great accuracy Of the twenty-one patients one died at the completion of the operation and one died several days after operation One recovered from the first stage but refused to permit the second stage One patient, after the first stage, showed signs of a transverse lesion of the cord but when, eight days later, I opened the dura widely, I failed to find a recognizable lesion of the cord There remain, then, seventeen patients in whom the operation was completed and whom we have followed closely for from one to three years The results at the present moment in these seventeen patients may be stated as follows

1 Six patients represent an early stage of essential hypertension All patients in this group are young women varying in age from 17 to 32 years of age Symptoms such as headache and shortness of breath were present and usually severe They exhibited blushing, sweating, lacrimation and palpitation of the heart Constriction of the retinal arterioles was demonstrable but renal and cardiac changes were minimal The *average* preoperative blood pressures established after long periods of observation varied between 180 and 210 systolic and 116 and 148 diastolic, the majority having the higher levels The patients have been followed for from two and a quarter to three years

In one with a preoperative average blood pressure of 190/122, the blood pressure has remained at 150/96 for three years and the patient is doing a normal person's work

In one with a preoperative average blood pressure of 206/148, the blood pressure has remained at 138/90 for twenty-eight months and the patient is in excellent shape

In one with a preoperative average blood pressure of 180/122, the blood pressure has remained at 152/106 for twenty-eight months and the patient is in excellent shape

In one with a preoperative average blood pressure of 210/130, the blood pressure remained at 140/94 for five months. Since then it has risen and now at thirty months is 170/110. The patient has no subjective complaints and works from 9 A. M. to 6 P. M. every day in a store.

In one with a preoperative average blood pressure of 210/130, the blood pressure remained at 154/104 for fifteen months. Since then it has risen and now at twenty-eight months is 190/118. She has no subjective symptoms and is in good shape.

In one with a preoperative average blood pressure of 210/130, the blood pressure remained at 164/110 for nine months. Since then it has risen and now at twenty-six months it is 220/128. She has no subjective complaints and works at her profession of nursing.

Of these six patients who represent a stage of the disease which would appear to be most favorable from the standpoint of treatment, three have had a satisfactory reduction of blood pressure which has persisted for from twenty-eight to thirty seven months. The remaining three had a satisfactory reduction in blood pressure for five, nine and fifteen months respectively after operation, then a gradual rise which at the end of from twenty six to thirty months, approaches but does not equal the preoperative level in two cases, and exceeds the preoperative level in one case. The improvement in the subjective symptoms in all patients has been striking and thus far has been permanent.

2. Three patients represent a severe benign hypertension with *moderate* vascular changes. There was some variation as to the rate at which the morbid process was advancing. In one patient severe secondary glaucoma developed and in another, attacks resembling transient apoplexy. The subjective symptoms were not especially marked. The *average* preoperative systolic blood pressures varied between 240 and 260, the *average* diastolic pressure varied between 140 and 160.

In one with a preoperative average blood pressure of 258/140, the blood pressure has remained at 208/126 for

twenty-three months The case is one of fixed hypertension of ten years standing There is subjective improvement

In one with a preoperative average blood pressure of 240/150, the blood pressure has remained at 210/132 for ten months There is subjective improvement and the attacks of unconsciousness (transient apoplexy) have not reappeared since operation

In one with a preoperative average blood pressure of 260/160, the blood pressure fell to 192/130 for three months, since then it has risen and now at ten months is 256/156 The glaucoma and headaches disappeared immediately after operation and have not reappeared

It is evident in these three patients with severe benign hypertension, but with only moderate demonstrable vascular changes, that the effects of the operation on the blood pressure have been slight The subjective improvement in two of the three cases has been marked

3 Three patients represent a severe benign hypertension with *marked* vascular changes The disease was of long duration Evidence of marked vascular changes was found in the eyegrounds, peripheral vessels and muscle removed at operation There were demonstrable cardiac and renal changes The blood pressure, especially the diastolic pressure, was regularly high

In one with a preoperative average blood pressure of 190/122, the blood pressure has remained at 176/112 for twenty-six months She is in good shape and doing well

In one with a preoperative average blood pressure of 270/160, the blood pressure remained at 240/150 for sixteen months when renal insufficiency rapidly appeared He died seventeen months after operation For sixteen months after operation he led an active life

In one with a preoperative average blood pressure of 230/142, the blood pressure remained at 210/122 for nine months when she died of apoplexy The relief of headaches was striking

In these three patients the blood pressure was not reduced significantly One patient with a blood pressure

stabilized at 176/112 for twenty six months is doing well. Two patients died from the disease, nine and seventeen months after operation. During these periods they had striking relief from their subjective symptoms.

4. Five patients represent the highly malignant type of hypertension. The disease was of short duration but within this period the vascular change was extreme. Marked neuroretinopathy was present in all these patients. In two, cardiac and renal changes were advanced, in two, they were moderate and in one, they had just appeared.

In one with a preoperative average blood pressure of 190/120, the blood pressure has remained at 150/100 for twenty-three months. His subjective symptoms disappeared and have not recurred. His papilledema and retinal exudates disappeared and have not reappeared. He lives an active outdoor life and is in excellent shape.

In one with a preoperative average blood pressure of 208/132, the blood pressure remained at 186/120 for seven months, since then the systolic pressure has risen and now at fifteen months is nearly at the original level, while the diastolic pressure has continued at its lower level. His subjective symptoms have disappeared. There has been definite improvement in the ocular fundi and no new hemorrhages or exudates have appeared. The disease, thus far, has been remarkably retarded.

In one with a preoperative average blood pressure of 190/124, the blood pressure remained at 184/122 for ten months. The papilledema disappeared. The patient's subjective symptoms disappeared and he felt in excellent health. Ten months after operation the patient was re-admitted with cardiac and renal failure and died.

In one with a preoperative average blood pressure of 270/170, the blood pressure remained at 210/140 for two months. The papilledema markedly diminished, the subjective symptoms improved. Two months after operation he died with left hemiplegia.

In one with a preoperative average blood pressure of 200/110, death occurred on the operating table just after



the completion of a one stage operation in which seven anterior roots on each side were divided. The patient was an example of hopeless malignant arteriolar nephrosclerosis with neuroretinopathy, detachment of the retina, cardiac hypertrophy and hypertension. It was one of our early cases and in view of our later experience should not have been subjected to operation.

Of these five patients, then, with a highly malignant type of hypertension, one at the end of twenty-three months has an excellent result, and one at the end of fifteen months has a good result but has again an elevated blood pressure. Two patients died from the disease, one ten months, the other two months after operation. In the intervals after operation their blood pressures were reduced and their subjective symptoms were greatly improved, as were the objective changes in their eyegrounds. One patient died immediately after operation.

Summarizing the whole series I may say. In early mild hypertension in young women, four of six patients have had a satisfactory reduction in blood pressure and relief of subjective symptoms for from two and a third to three years. Two of six patients have had complete relief of subjective symptoms, are in good health and doing their usual work twenty-six and twenty-eight months after operation, but their blood pressures, after being reduced satisfactorily for nine and fifteen months, have again risen to approximately preoperative levels.

In severe benign hypertension, three patients show a slight but an unsatisfactory reduction in blood pressure. They show, however, marked subjective and objective improvement at the end of ten to twenty-three months.

In severe benign hypertension with marked vascular changes, one of three patients has had a fairly satisfactory reduction in blood pressure for twenty-six months and is in good physical shape with a minimum of subjective symptoms. Two of three patients showed a definite reduction of blood pressure but died of the disease sixteen and nine months respectively after operation. The relief of

subjective symptoms was striking and one led an active life for over a year after operation

In severe malignant hypertension, one of five patients has had a satisfactory reduction in blood pressure and he leads an active normal life two years after operation. One had a considerable reduction in blood pressure for seven months, but at the end of fifteen months his systolic pressure nearly equals his preoperative pressure, while his diastolic pressure remains satisfactorily reduced. He is greatly improved. Three of the five patients died—one immediately after operation, one two months after operation and one ten months after operation.

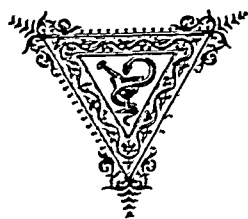
*Discussion* It must be evident from this summary of the various surgical methods which have thus far been used in the treatment of essential hypertension, how far we are from knowing accurately their ultimate value. A study such as this shows clearly the necessity of accurate and repeated observations over a fairly prolonged period before treatment is undertaken, and of a period of follow-up studies which must be continued over years rather than over weeks or months. It would be rash to attempt to appraise the value of these methods from the meager information we have, but I may, perhaps, from the clinical and experimental data available, discuss what may be expected of them.

The cause of hypertension is not as yet known. The occurrence of the disease under such a variety of conditions suggests perhaps that no single cause is responsible for its initiation. Ablation experiments on normal and hypertensive animals and clinical observations on human subjects fail to indicate definitely that any of the glands of internal secretion (such as the hypophysis, adrenal, ovary, thyroid or pancreas) are primarily at fault. While the proof of the matter must await further clinical experience, it does not appear likely that therapeutic attacks directed at single glands of internal secretion such as the irradiation of the hypophysis or subtotal adrenalectomy will solve the problem of the treatment of the condition. Nor is there any convincing evidence as yet that the morbid

process in essential hypertension lies exclusively in the central nervous system. While it appears that the splanchnic vessels contribute an important flexible reservoir which governs the level of arterial pressure, both clinical and experimental data indicate that a peripheral motor mechanism residing in the blood vessels themselves may sustain the blood pressure even at an elevated level. This is indicated by the eventual rise in pressure following complete destruction of the spinal cord below the seventh cervical segment in animals and by an accumulating clinical experience following resection or division of sympathetic nerves controlling the vessels of the splanchnic area. Viewed in the light of this experience, the surgical operations of supra- or sub-diaphragmatic splanchnicotomy, celiac ganglionectomy and anterior spinal nerve root section are likely in the long run to be only partly effective, for, if we grant that they do not attack directly the cause of the disease, they can affect only that part of the blood pressure controlled by the sympathetic fibers which they interrupt. Our studies on the effects of anterior nerve root section, however, show that in the early mild hypertension and even in malignant hypertension the tendency of the blood pressure after operation to rise and again approach the preoperative level may not be apparent after two to three years, and it is possible, though not yet proven, that the interruption of the sympathetic fibers controlling the splanchnic area may cause, in certain cases, the identification of which is not yet possible, a permanent reduction in blood pressure.

While, then, the permanent effects of our surgical procedures with respect to the blood pressure in hypertension have not been established, their effects upon the subjective and some of the objective manifestations of the disease appear more certain. With scarcely an exception in our experience, anterior root section has caused a striking improvement in headaches and other subjective symptoms of the disease, an improvement so satisfactory to the patients as to justify the operation on this basis alone. Equally striking is the disappearance of papilledema,

hemorrhage and exudates in the eyegrounds, changes for the better which may follow what seems an insignificant reduction in the blood pressure. Such results are not readily explained but they continue to excite our interest. I have observed, as have others, patients with essential hypertension incapacitated and practically bed-ridden as a result of the disease, returned to their customary work for a period as long as three years, an experience which encourages me to continue to explore the possibilities of surgery in its treatment. What surgical procedure will prove to be the most productive of lasting benefit consistent with reasonable safety to the patient remains at the moment undecided.



# PRERENAL AZOTEMIA AND THE PATHOLOGY OF RENAL BLOOD FLOW\*

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Deficient urinary elimination with resultant azotemia and uremia results not only from intrinsic disease of the kidneys and urinary passages, but may also be a reflection of pathological processes in other parts of the body. From the point of view of the sequence of events in the elaboration of the urine, one may speak of nitrogen retention of the latter category as *prerenal azotemia*—in contradistinction to renal azotemia due to primary disease of the kidneys and postrenal azotemia resulting from obstruction of the urinary passages. This discussion will be confined to the renal and prerenal azotemias, leaving the nitrogen retention that so often results from lesions of the urinary passages to the urological section of the program.

## THE FUNDAMENTAL CRITERION OF IMPAIRMENT OF RENAL FUNCTION

To the clinician, *the outstanding and defining characteristic of impairment of renal function is a concentration of the urine disproportionately low in comparison to the urinary volume.* Thus, if a hypertensive patient with obvious heart failure passes a random specimen of urine which is deeply colored and obviously of high concentration, the inference is warranted that renal function is not significantly impaired. On the other hand, if the urinary volume is small, say 400 c c in 24 hours, and nevertheless the urine is pale and of low concentration, one may conclude that renal function is severely impaired. Analysis of tests of renal function which have proved of value shows that they include as a fundamental factor the concentration of one or more urinary constituents. In the light of the mechanism of the elaboration of the urine, it is not surprising that the concentrating ability of the kidney is a trustworthy index of its functional

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capacity While many of the details of kidney function are still obscure, their integration is almost entirely expressed in the transference of substances preformed\* in the plasma to the lumen of the urinary tubules, chemically unchanged but mostly in far higher concentration than in the plasma Concentration of the potential urinary constituents in the plasma is the fundamental accomplishment of the kidney, and measurement of the concentrating ability of the kidney mirrors the functional capacity of the organ

### THE STAGES OF IMPAIRMENT OF RENAL FUNCTION

In evaluating the significance of impairment of renal function for the organism as a whole, it is to be borne in mind that the kidney, like most other organs, is endowed with a large factor of safety, the healthy kidney is able to master a far greater excretory load than ever presents itself in the usual course of life On the basis of the ensuing systemic manifestations, one may differentiate three stages of impairment of renal function

1 A latent stage in which the impairment of renal function is so slight as only to narrow the factor of safety and have no deleterious effect on the organism This stage can be demonstrated only by means of tests of renal function which show, for example, that the urea clearance is diminished or the maximum specific gravity in the concentration test is subnormal But the blood chemistry is unaltered and the 24-hour urinary volume is not increased Of course, if in this latent stage of impairment of renal function the kidney is confronted by a very heavy burden, it will fall behind the accomplishment of a healthy kidney An illustration is not uncommonly furnished when urea is given in large doses as a diuretic in the nephrotic syndrome, the urea content of the blood then rises to higher levels than is usually the case with corresponding doses in the presence of healthy kidneys

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\* The urinary constituents, notably ammonia and at least some of the hippuric acid, which are synthesized by the kidney itself appear to be few in number

2 In the second stage of impairment of renal function, the concentrating ability of the kidney is diminished, but this is atoned for by increase in urinary volume so that the urea content of the blood remains at a normal level. In analogy with the terminology customary in heart disease, the teleologically-minded may speak of compensated impairment of renal function. This stage is characterized by pronounced diminution in the maximum specific gravity of the urine in the concentration test accompanied by normal urea content of the blood. The urea clearance may be either subnormal or normal, as a result of increase in urinary volume, a normal urea clearance may be obtained despite diminution in the urea concentration in the urine. While symptoms due to retention of urinary constituents are of course absent in this stage of compensation, the polyuria may be manifested by frequency of urination during the day and nocturia, as well as objectively by a dry skin. In forms of the contracted kidney which are but slowly or not at all progressive, this stage of compensated impairment of renal function with polyuria but no retention may last for years.

3 In the third stage of impairment of renal function, the accomplishment of the kidneys fails to master the excretory load with consequent retention of urinary constituents in the blood and tissues. The resulting clinical picture is known as uremia.

#### PATHOGENESIS OF UREMIC SYMPTOMS

The term uremia was introduced a century ago to mean urine in the blood, and since then the conception has been dominant that the symptoms are due to poisoning by retained urinary constituents, i.e., that uremia is purely an auto-intoxication by katabolic products which fail of elimination by the kidney. In addition to urea, creatinin, and other resultants of endogenous metabolism, products of intestinal putrefaction, including highly toxic phenol derivatives, accumulate within the body. Of late years, however, it has become clear that by no means all the symptoms of uremia are of such toxic origin. Another

factor that is undoubtedly of great importance in many instances is excessive loss of water and certain electrolytes in the urine with resultant dehydration and demineralization of the organism. We have seen that already in the compensated stage of impairment of renal function, the polyuria evoked by the impairment of concentrating ability may produce dehydration of the organism. With advance to the decompensated stage, the dehydration may become much more severe, in fact, patients with long standing severe impairment of renal function present extreme dehydration, in the pathogenesis of which the polyuria is abetted and later supplanted by gastro intestinal disturbances, which on the one hand interfere with the absorption of water and on the other hand result in loss of water by vomiting and diarrhea. Demineralization is also a consequence of severe impairment of renal function. The functionally impaired kidney is not able to form as much ammonia from urea as the intact organ, nor is it able to elaborate as highly acid a urine as in health. To substitute for ammonia in neutralizing the predominantly acid end products of metabolism, the fixed base of the body is drawn upon and thus lost in the urine. Moreover, Peters has found that the insufficient kidney excretes chloride at lower plasma chloride levels than in health. These and other factors, especially vomiting, diarrhea and inadequate absorption when gastro intestinal disturbances are present, serve to deplete the electrolytes of the body in many uremic patients. In the case of calcium, the plasma content is further lowered in consequence of phosphate retention and the frequently depressed protein content of the plasma. In addition to the symptoms which result from exsiccation of the tissues, it will be seen later that dehydration can further lower the functional efficiency of the kidney and thus, initiating a vicious circle, in turn aggravate the severity of uremia. One manifestation of the derangement in mineral metabolism due to renal insufficiency to which attention may be briefly called at this juncture is renal rickets. It has long been known that renal insufficiency of sufficiently long duration in childhood, when skeletal



growth is most active, may result in severe skeletal deformities, the so called renal rickets. It seems very plausible that the demineralization of the skeleton due to long standing renal insufficiency is of primary importance in the pathogenesis of this remarkable skeletal dysplasia.

There are thus two general ways in which renal insufficiency acts deleteriously on the organism. 1. By causing retention of various substances which should be excreted in the urine, 2. By producing dehydration and demineralization of the body in consequence of excessive excretion of water and certain electrolytes. The acidosis which is often prominent in the symptomatology of uremia results from both these factors. Impairment of the synthetic functions of the kidneys also have harmful effects but this is probably largely, as we have already seen in the case of ammonia, through the two mechanisms just mentioned. That the organism suffers in renal insufficiency as a result of loss of an internal secretion of the kidney is as yet purely hypothetical.

The recent realization of the significance of the disturbance in water and salt metabolism in uremia parallels a similar development in the other classical auto-intoxication, diabetic coma. Both diabetic coma and uremia were long considered almost pure poisonings, in the one instance by ketonic acids, in the other by urinary constituents. This is probably largely true when they arise suddenly, as in the uremia of acute urinary suppression or obstruction, or in diabetic coma in a young diabetic previously well controlled and without glycosuria who develops an acute infection or discontinues insulin. But the situation is different when the uremia climaxes a long period of renal insufficiency or the diabetic coma terminates protracted severe glycosuria and ketonuria. Here the previously existing dehydration and demineralization become accentuated and participate importantly in the pathogenesis of the final picture. It is this common feature of dehydration and demineralization that largely accounts for the striking analogies in the clinical pictures of many instances of uremia and diabetic coma.

## PRERENAL AZOTEMIA

In the foregoing we have considered renal insufficiency and consequent azotemia due to disease of the kidneys, in which the structural alterations in the glomeruli and tubules seem adequate to account for the renal failure. We now turn to another type of defective renal excretion and resultant azotemia in which, while there may be severe depression of renal function, this is not accounted for by the morphological changes in the kidneys, for the latter may be absent or no more considerable than are often to be found at the postmortem examination of individuals without renal insufficiency. As already mentioned, this form of nitrogen retention may logically be termed *prerenal azotemia*. This term is preferable to the designation *extrarenal azotemia*, which has frequently been used, for the latter fails to differentiate from the common azotemias due to obstruction of the urinary passages. Knowledge of the prerenal azotemias dates back to the observation by Tileston and Comfort in 1913 that pronounced enhancement of the nonprotein nitrogen of the blood results from intestinal obstruction with vomiting. Only in the past few years, however, has there been general appreciation of the frequency of the prerenal azotemias—a realization that has been reflected in therapeutic results.

Before discussing the pathogenesis of the prerenal azotemias, it may be worth while to enumerate the most important circumstances in which they occur.

## OCCURRENCE OF THE PRERENAL AZOTEMIAS

- 1 Severe and protracted vomiting, such as is encountered in pyloric and intestinal obstruction and hyperemesis gravidarum. In chronic intestinal obstruction without vomiting but with accumulation of enormous volumes of intestinal contents in the dilated loops of gut, the nonprotein nitrogen of the blood may rise. In the uremia of organic renal disease, vomiting may add a prerenal to the renal factor in the causation of the azotemia.

- 2 Immoderate loss of intestinal contents in diarrhea or rarely duodenal fistula. Azotemia of this origin occurs

commonly in infants but is rare in adults, apart from cholera, unless there is complication by vomiting so that the lost fluid and salt is not replaced

3 In certain affections of the liver and biliary passages Not very rarely, when convalescence seems smoothly initiated after operations on the gall bladder or common duct, after an interval of from one to six or even more days, malaise develops, the temperature rises, oliguria sets in, the nonprotein nitrogen of the blood rises, the patient becomes restless and then perhaps delirious or comatose, and may succumb with the clinical picture of uremia A similar picture has been observed following traumatic pulpification of the liver and may occur during acute liver degeneration or in acute exacerbations of chronic liver disease While marked degeneration of the renal tubules may be found at necropsy, in other cases, despite azotemia and the clinical picture of uremia, little morphological change in the kidneys is demonstrable The syndrome just described has been spoken of as the "hepato renal syndrome" or "liver death," and is one of the chief dangers of those undergoing gall bladder surgery

4 In diabetes with acidosis, either in coma or precoma, or in the complete absence of cerebral symptoms with only such complaints as weakness or loss of weight, marked nitrogen retention may be found The azotemia may continue to mount after the patient has been brought out of coma by insulin Significant azotemia is present in about half of comatose diabetics The azotemia usually occurs only after a protracted period of acidosis with polyuria and rarely in previously well controlled diabetics who have gone into coma rather abruptly as a result of cessation of insulin or an infection

5 In the crises of Addison's disease there is a rise in the nonprotein nitrogen of the blood The same occurs in much more pronounced degree in experimental removal of the supra renal glands and is so characteristic that it has served as a means for testing the potency of cortical extracts

6 In traumatic shock the nonprotein nitrogen of the blood often rises to considerable heights

7 In postoperative collapse (surgical shock) there may be pronounced azotemia

8 In the circulatory collapse of pneumonia, diphtheria, sepsis, peritonitis, and other infections, the nonprotein nitrogen of the blood may attain high levels

9 In widespread burns with shock, there may be great azotemia

10 In coronary thrombosis with shock, the nonprotein nitrogen occasionally rises notably and may exceed 100 mg per cent Nitrogen retention was present in five of six fatal instances of myocardial infarction studied by Steinberg

11 Following profuse hemorrhage, notably from the gastrointestinal tract, azotemia may appear and even surpass 100 mg per cent of nonprotein nitrogen Alsted found the blood urea increased in 12 of 25 patients with hematemesis and melena

### CLINICAL PICTURE OF PRERENAL AZOTEMIA

In each of the variegated circumstances just enumerated, the following syndrome may develop

1 A symptomatology akin to that accompanying renal insufficiency due to primary renal disease As in patients with Bright's disease, considerable degrees of azotemia may exist without reflection in the clinical symptoms, while in other cases there is progressive muscular and mental asthenia deepening to coma, vomiting, diarrhea, a urinous breath, and the other classical manifestations of uremia, including rarely pericarditis

2 Increase in the nonprotein nitrogen of the blood due not only to rise in urea but also involving creatinin and uric acid, the other nonprotein nitrogenous constituents have hardly been studied, apart from observations of increase in amino acids in some instances of hepatic disease

3 Decrease in the chloride content of the plasma is the rule but, it is to be emphasized, is by no means constant

Depending on the underlying condition there may be either acidosis (as in diabetic coma and Addison's disease) or alkalosis, as is most often the case in azotemia due to vomiting

4 Usually there is pronounced oliguria, which may go on to anuria. However, especially in the cases due to diabetic acidosis but also occasionally in liver disease, there may be a stage of pronounced polyuria, even 2000 cc of urine daily, despite pronounced and mounting azotemia

5 The urine is usually of rather high specific gravity at the onset, and this may persist throughout. However, in many of the cases one is able to trace a progressive decrease in specific gravity so that this may be no higher than 1.010 despite azotemia and marked oliguria

6 The urine may reveal no abnormal constituents. But moderate albuminuria may appear, it may be accompanied by red cells as well as hyaline and granular casts in the sediment

7 Most often there are definite evidences of peripheral circulatory failure resulting in shock of more or less severity. The more carefully one follows the course of the cases, the more often the signs of peripheral circulatory failure are to be detected. When pronounced, the peripheral circulatory failure is manifested by pallor with or without greyish cyanosis, sweating skin, cold extremities, most often a fall in arterial pressure, and, what is most characteristic, collapsed peripheral veins with low venous pressure

8 Frequent remarkable improvement with decrease in azotemia as a result of the intravenous administration of salt and sugar solutions

#### PATHOGENESIS

We may now turn to the important, interesting and, it may be remarked at the onset, as yet largely unsolved problem of the pathogenesis of prerenal azotemia. The first question that arises is the following: Is the accumula-

tion of potential urinary constituents in the blood due to augmented break-down of body protein or is it due to decreased accomplishment of the kidney? In other words, is the azotemia due to overloading of the kidneys or to failure of the kidneys?

**INCREASED DESTRUCTION OF PROTEIN**—Studies of nitrogen excretion in the urine have shown that there is increased protein destruction in at least many of the conditions leading to prerenal azotemia—the alimentary toxicosis of infants, diabetic acidosis, acute affections of the liver, etc. Such increased protein destruction must tend to augment the nonprotein nitrogen of the blood when the kidneys are insufficient. But that the increased protein destruction in these conditions is sufficient to produce pronounced azotemia in the presence of unimpaired renal excretion is very unlikely. When kidney function is good, one can administer quantities of urea far greater than those resulting from even very greatly accelerated protein katabolism without producing more than slight increase in the urea content of the blood. I have repeatedly given 75 or even 100 grams of urea daily for a week or longer to patients with cardiac edema without increasing the urea nitrogen content of the blood to more than 30 or 40 mg per cent. On the other hand, when renal function is impaired, as it often is in patients with edema due to glomerulo nephritis, the administration of urea may cause a considerable increase in the urea content of the blood. The factor of safety of the kidneys appears to be so great that when their function is unimpaired they are able to eliminate the end products of the most extreme acceleration of protein metabolism occurring in disease with little accumulation of these substances in the blood. It thus seems fair to conclude that increase in the nitrogenous end products of metabolism is at most an accessory factor in pronounced prerenal azotemia, and that when considerable azotemia is present, one must conclude that renal excretion is subnormal.

**IMPAIRMENT OF KIDNEY FUNCTION**—Tests of kidney function afford direct evidence of the functional impair-

ment of the kidneys in prerenal azotemia. This is contrary to an opinion previously held by the speaker, which was based on the observation of high specific gravity of the urine in prerenal azotemia. However, the concentration of the urine can be rationally interpreted only in the light of the urinary volume. As already emphasized, the fundamental criterion of impairment of renal function is a concentration of the urine disproportionately low in comparison to the volume. Thus, while a specific gravity of 1.020 is evidence of good kidney function when the urinary volume is normal or but little reduced, it is too low if the urinary volume is very small, say under 400 c c in 24 hours. Such a disproportionately low concentration of the urine is demonstrable in at least the vast majority of instances of prerenal azotemia. It is true that sometimes the specific gravity and urea concentration of the urine are so high that the concentrating ability seems unimpaired. Thus, the specific gravity may exceed 1.030 and the urea concentration even reach 5 per cent, the latter of which is close to the maximum urea concentration of which even the healthy human kidney is capable. In such instances, the possibility is to be considered that the azotemia is due purely to extreme diminution in urinary volume, perhaps associated with augmented breakdown of protein, in the absence of the decreased concentrating ability which bespeaks impairment of renal function. But in the vast majority of patients with prerenal azotemia, comparison of the specific gravity with the urinary volume shows that the concentrating ability is definitely decreased. Not uncommonly, if one follows the course of the case, progressive impairment of the concentrating ability is evident. At the start the oliguria is accompanied by a fairly high specific gravity of the urine, which then progressively decreases despite the fact that the urinary volume does not rise and may also decrease. I have repeatedly seen exquisite examples of such a course of events in prerenal azotemia due to vomiting, to diabetic acidosis, to liver disease, and to hemorrhage. In such instances, the specific gravity of the urine may become

fixed around 1.010 despite oliguria, just as occurs in primary renal diseases. It may be several days after the cause of the prerenal azotemia has disappeared before the concentrating ability of the kidneys is restored. Thus, in a recent patient with vomiting and diarrhea due to gastroenteritis, in whom the nonprotein nitrogen of the blood exceeded 100 mg per cent and whose urinary specific gravity was fixed close to 1.010 in two concentration tests, it was almost a week before the concentrating ability returned. The urea clearance test also shows the impairment of renal function in prerenal azotemia, very low results may be obtained. Experimentally, the decrease in concentrating ability in prerenal azotemia has repeatedly been demonstrated. McQuarrie and Whipple long ago showed that in dogs with azotemia due to the vomiting of intestinal obstruction, the urea concentration ratio is decreased. In dogs in which dechloridation was produced by a low chloride diet and repeated vomiting, Ambard found that the maximal concentration of urea in the urine dropped to a third of its previous value.

**MECHANISM OF IMPAIRMENT OF RENAL FUNCTION IN PRERENAL AZOTEMIA**—The next question that arises is that of the mechanism of the impairment of renal function leading to prerenal azotemia. The anatomical findings do not answer the question. In all the conditions enumerated—vomiting, diabetic acidosis, Addison's disease, liver disease, traumatic shock, postoperative collapse, hematemesis, etc.—the patient may succumb with severe impairment of the concentrating ability of the kidney and azotemia, and yet the necropsy reveals little change in the kidneys. These are the cases that have been described as uremia with intact kidneys. In some instances neither the glomeruli nor the tubules show appreciable changes. More often, while the glomeruli are intact, the tubules are the seat of moderate regressive changes, such as cloudy swelling, hyaline-droplet degeneration, fatty change, or even necrosis of isolated cells. However, such changes in the tubular epithelium are the rule in patients who succumb to any protracted illness, and may occur with



like or greater intensity in persons with the same underlying condition but no azotemia. Much less often, there is widespread necrosis of the tubular epithelium, this and the focal calcification which sometimes occurs will be discussed later. Nevertheless, the fact that the large majority of the cases present no significant anatomical changes at post mortem shows that the explanation of the azotemia must be sought in factors which depress kidney function although they are not documented by structural alterations revealed by present morphological methods.

Among the factors which have been thought to be concerned in depressing the accomplishment of the kidneys and thus producing azotemia are the following:

1. *Hypochloremia*. In many forms of prerenal azotemia there is decrease in the chloride content of the blood. This is usually especially pronounced in conditions with vomiting. The intravenous administration of sodium chloride solution may result in prompt improvement with decrease in azotemia. On the basis of these facts, it has been thought that decrease in the chloride content of the blood may cause azotemia, the French speak of *azotémie par manque de sel*, and the expression hypochloremic azotemia has gained considerable currency. Some have advocated a teleological explanation of the connection between hypochloremia and azotemia, retention of urea in the blood, through unexplained mechanisms, is thought to compensate for the fall in osmotic pressure due to the diminution in chloride. However, this conception is scarcely tenable, urea passes through biological membranes so readily that it soon attains equal concentration in blood and most tissues so that it would not compensate osmotically for decrease in the concentration of an electrolyte in the blood. Others have thought that hypochloremia entails azotemia through the intermediacy of impairment of renal function. We have already seen that impairment of renal function is actually responsible for the azotemia. But there is no evidence that hypochloremia, even when present, is *specifically* responsible for the impairment of renal function. Almost all forms of prerenal azotemia may occur

in the absence as well as in the presence of hypochloremia. Even the fact that the azotemia is diminished by the administration of sodium chloride does not prove that chloride deficiency *per se* is responsible for the nitrogen retention. Infusions of sodium chloride solution may have this effect in the absence of hypochloremia, for example in traumatic or postoperative shock or in the azotemia which follows hemorrhage. As will be seen later, the impairment of renal function seems to be correlated with dehydration and decrease in circulating blood volume, and when hypochloremia is present it participates in the pathogenesis of the impairment of renal function only to the extent of, and through its role in, the production of dehydration and decrease in circulating blood volume.

*2 Low arterial pressure* The conditions leading to prerenal azotemia are frequently accompanied by low arterial tension. It has been thought that the low arterial pressure impairs renal function with resultant azotemia. That sufficient fall in arterial pressure must affect renal function adversely would be anticipated from the known importance of glomerular filtration in the elaboration of the urine and from the results of animal experiments, which have shown that profound fall in general arterial pressure is accompanied by diminution in urinary volume. When the arterial pressure falls to shock levels, there seems little doubt that the low pressure is concerned in the pathogenesis of the impairment of renal function and resultant azotemia. But much more often the fall in arterial pressure in patients with prerenal azotemia is not sufficiently pronounced to account for severe impairment of renal function. Often, indeed, there is no fall in blood pressure.

*3 Toxic nephritis* Damage to the kidney by circulating toxins derived from bacteria or tissue autolysis with resultant "toxic nephritis" has repeatedly been incriminated as the cause of azotemia in such conditions as intestinal obstruction, the intestinal toxicosis of infants, collapse in the acute infections, liver disease, and other

forms of prerenal azotemia The changes in the tubular epithelium are regarded as manifestations of such toxic damage However, the actual existence of the toxins in question has not been demonstrated The often remarkably rapid improvement in renal function following the intravenous administration of salt solution scarcely speaks for toxic damage of the kidney sufficiently severe to produce azotemia Moreover, the course and clinical accompaniments of the azotemia and anatomical changes in the kidneys in intestinal obstruction and other conditions in which bacterial or autolytic toxins have been suspected is so similar to that in the azotemia of hematemesis, traumatic shock, duodenal fistula, Addison's disease and other conditions in which a circulating toxin seems highly improbable, as to cast doubt on the role of toxins in the former The conception of a "toxic nephritis" as responsible for the forms of azotemia under discussion thus seems purely hypothetical

4 *Alkalosis* Azotemia due to vomiting is most often accompanied by alkalosis It has been thought that the alkalosis may injure the kidneys and thus produce azotemia The conception is based largely on clinical observations of renal damage in individuals taking large amounts of sodium bicarbonate for the treatment of peptic ulcer and on the production of renal damage following the long continued administration of alkalis to animals But that the brief alkalosis in the conditions under discussion damages the kidneys so severely as to produce azotemia has not been demonstrated

#### DECREASED RENAL BLOOD FLOW

None of the factors thus far considered seems to play more than an accessory role in the causation of prerenal azotemia In the following we shall consider evidence indicating strongly that the primary pathogenetic factor in most, if not all, instances of prerenal azotemia is decrease in blood flow through the kidneys

In each of the conditions leading to prerenal azotemia—excessive vomiting, hemorrhage, postoperative collapse,

coronary thrombosis, diabetic coma, Addison's disease, etc—circulatory failure is notoriously apt to develop. The circulatory failure in question is not cardiac insufficiency but primarily peripheral circulatory failure which results in deficient venous return to the heart. It is now known that in at least most forms of peripheral circulatory failure, the deficient venous return to the heart is a manifestation of decrease in circulating blood volume. The clinical picture resulting from pronounced peripheral circulatory failure is that known as shock—pallor or greyish cyanosis, cold extremities, relatively empty peripheral veins, low venous pressure, and usually low arterial pressure. Examination of patients with prerenal azotemia reveals some or all of these evidences of peripheral circulatory failure in more or less pronounced form. Moreover, when therapy directed to the alleviation of the peripheral circulatory failure—which almost always consists in the intravenous injection of glucose or saline solutions or the transfusion of blood intended to elevate the circulating blood volume—is successful, the azotemia clears up *pari passu* with improvement in the other manifestations of peripheral circulatory failure.

Time will not permit the discussion of the mechanisms leading to the peripheral circulatory failure that in turn engenders the azotemia. Suffice it to say that numerous investigators, beginning with those who studied wound shock during the World War, have demonstrated that the large majority of forms of peripheral circulatory failure, if not all, are mediated by a decrease in the circulating blood volume. Such diminution in the volume of circulating blood is brought about by different mechanisms in the individual conditions in which peripheral circulatory failure and consequent prerenal azotemia may develop. In hemorrhage the cause is directly the loss of blood, in traumatic shock apparently seepage of plasma into the traumatized area, in vomiting and diarrhea the loss of fluid and even more of salts produces dehydration, in diabetic acidosis protracted glycosuria and ketonuria entail dehydration, in the crises of Addison's disease there

is a sharp diminution in circulating blood volume apparently correlated with the disturbance in sodium and potassium metabolism, in postoperative collapse a variety of factors combine to produce a negative water balance and consequent dehydration, in burns large volumes of plasma seep from the capillaries onto the denuded surface or into blebs

In each of these conditions the decrease in circulating blood volume entails a diminished venous return to the heart with an equal fall in cardiac output. This drop in cardiac output is manifested in turn by decreased blood flow through the organs, including the kidneys

It is, indeed, quite probable, although direct experimental verification is necessary, that the blood flow through the kidneys in peripheral circulatory failure is proportionately more diminished than is the cardiac output. There is ample evidence that with decrease in cardiac output blood flow through all the organs is not equally diminished. The organs which are less immediately vital to the survival of the organism have their blood supply cut down the most. This is accomplished by constriction of the arterioles in these organs. Various investigators have demonstrated directly, by perfusion experiments, that the arterioles in the extremities of an animal in shock are constricted. It is this arteriolar constriction which results in the cold hands and empty veins in the extremities of a patient in shock, the venous pressure in the antecubital veins of such a patient may be less than 1 cm of water. Presumably, also, constriction of the arterioles is concerned in the generalized pallor or pallid cyanosis of the patient with peripheral circulatory failure. The cutting down of blood flow in relatively nonvital organs was studied quantitatively by Gesell. He showed that when cardiac output is diminished by 10 per cent, the volume of blood flow through the submaxillary gland is decreased 60 per cent, i.e., six times as much. Evidently, when the venous return and consequently the cardiac output is cut down, the blood supply to the immediately vital organs, notably the central nervous system and heart, is maintained at the expense of

lessening the blood flow to the extremities and other not immediately vital parts by vasoconstriction. The teleologically minded may say that the organism is abandoning its outposts in the extremities to defend its capitol in the heart and central nervous system.

Whether the cutting down of blood flow through the kidneys in peripheral circulatory failure is proportionately as great as through the extremities, skin and submaxillary gland, is not known. However, in human shock cardiac output is doubtless diminished far more than the 10 per cent in Gesell's experiment, so that the diminution in blood flow through the kidneys, even though it is proportionally less than the decrease in flow through the submaxillary gland and extremities, may be very great.

That abundant blood flow is a *sine qua non* for adequate renal function has long been known. Various physiological experiments have shown that decrease in renal blood flow is promptly reflected in diminution in urinary volume. Most important from our present point of view, however, are the recent brilliant investigations of Van Slyke and his coworkers in which they measured the volume of renal blood flow in the unanesthetized dog. These experiments established the important result that the urea clearance closely parallels the blood flow through the kidneys, variations in the percentage of urea removed from the blood being less important in the genesis of alterations in the amount of urea excreted. These experiments enable us to understand why peripheral circulatory failure with its diminished renal blood flow is reflected in azotemia.

In view of the role of decreased renal blood flow in the pathogenesis of azotemia in peripheral circulatory failure, it may be asked why the latter so rarely, other than pre-mortally, results from heart failure. Quite probably, one reason is that heart failure is accompanied by increase in capillary pressure, which favors glomerular filtration and thus tends to neutralize the effects of diminished volume of renal blood flow. Moreover, it is improbable that except terminally, when azotemia may occur, heart failure

decreases cardiac output as much as does peripheral circulatory failure

The conception of the fundamental importance of decreased volume of blood flow through the kidneys as the basis of prerenal azotemia is in excellent accord with the characteristic functional and morphological findings

(a) *Functional* The urinary volume is almost always decreased in patients with prerenal azotemia. Often the concentration of the urine is relatively high, although usually it is not as high as would be expected in relation to the volume of the urine were the kidneys functionally intact. Furthermore, the observation can often be made that with the persistence of the oliguria the maximal specific gravity of the urine falls more or less rapidly until it may be fixed close to 1.010. The decreased urinary volume is readily understood as a manifestation of diminished volume of blood flow through the glomeruli. The lessened concentrating ability of the kidneys is doubtless a manifestation of impaired tubular function, which, in the light of the great oxygen consumption of the kidney, is readily comprehensible on the basis of decreased renal blood flow. Likewise, the not uncommon slight albuminuria may well be due to injury to the glomerular membrane as a result of decreased blood flow.

(b) *Morphological* At necropsy patients with prerenal azotemia may present very little structural alteration in the kidneys. In other cases, however, there are marked regressive changes in the tubular epithelium, which may attain widespread necrosis, rarely with foci of calcification. These changes are readily explained on an ischemic basis; the intensity of the regressive changes presumably largely parallels the degree of the diminution in renal blood flow.

#### REMARKS ON THERAPY

Time is lacking for detailed discussion of therapy. A few words may be permitted, however, regarding the significance for the course of renal and prerenal azotemia of measures which affect the volume of blood flow through the kidneys.

Restriction of protein in the diet has long been the cornerstone of the management of patients with renal insufficiency, especially when there is nitrogen retention in the blood. The conception underlying protein restriction has been that, since the ability of the kidneys to excrete the nitrogenous end products of protein metabolism is diminished, it is wise to decrease the ingestion of protein to an amount within the capacity of the kidneys to eliminate and thus avert nitrogen retention. In actual practice, however, one often has the impression that, even though rigid restriction of protein in the diet achieves the "laboratory success" of lowering the nonprotein nitrogen of the blood to some extent, the patient becomes weaker and more anemic. In such cases, the addition of protein to the diet is sometimes followed by subjective improvement and rise in the hemoglobin content of the blood. From the point of view of the relation of diet to renal function, there are also experimental observations indicating that in the past protein restriction has often, if not usually, been carried too far in the treatment of renal insufficiency. Jolliffe and Smith showed that dogs have a higher urea clearance when on a high protein diet than when on a low protein diet. This observation has been confirmed by Van Slyke and his coworkers, who found in the dog that the urea clearance may be as low as 15 cc per minute on a low protein diet and as high as 90 cc per minute on a high protein diet. The latter investigators also showed that the variations in urea clearance brought about by diet parallel variations in blood flow through the kidney. There is excellent experimental evidence to show that a low protein diet tends to lower both the functional accomplishment of the kidneys and the blood flow through these organs. It would appear highly undesirable further to lower blood flow through kidneys in which the circulation is already hindered by such processes as glomerulonephritis or arteriolar sclerosis. Theoretically, at least, it thus appears that protracted low protein diet may be undesirable both from the point of view of diminishing the functional accomplishment of the kidneys



and because of the possibility that the progress of the pathological process may be accelerated by decreased renal blood flow. Moreover, most patients with renal disease have at least a tendency to hypoproteinemia, and since Epstein's work it is known that low protein diet may further lower the protein content of the plasma. It would appear that the question of the protein ration in renal insufficiency merits consideration from broader points of view than have generally been adopted in the past. Too often there has been a tendency to regard the functional capacity of the kidney as fixed without considering the great probability that even the severely diseased organ may be able to increase both its functional accomplishment and its blood supply in response to greater demand. Of late years I have become less and less stringent regarding protein restriction and believe that the patients are definitely the better for it.

In patients with prerenal azotemia, the cardinal therapeutic indication is obviously to elevate the decreased circulating blood volume and thereby increase the cardiac output and with it the blood flow through the kidneys. The measure called for is almost always the intravenous injection of the solution best calculated to restore the blood volume in the condition in question. Transfusion of blood is the most useful in shock due to hemorrhage or trauma and may also be very valuable in other forms of peripheral circulatory failure. In almost all forms of prerenal azotemia the use of the intravenous drip of sodium chloride solution with or without glucose is the fundamental therapeutic measure, and one which is often life saving. In those forms of prerenal azotemia which result from depletion of electrolytes—for example, in vomiting, diabetic coma, and the crises of Addison's disease—the administration of hypertonic sodium chloride solution may lead to quicker improvement than does physiological salt solution. It need hardly be emphasized that when the circulating blood volume is decreased as a result of loss of electrolytes, the administration of hypertonic glucose solutions does not fulfill the therapeutic

indication, sodium chloride must also be given to rebuild the skeleton of electrolytes on which the circulating volume is maintained

### SUMMARY

The primary criterion of impairment of renal function is a concentration of the urine disproportionately low in comparison to the urinary volume

When impairment of renal function arises from gradually progressive lesions of the kidney, as in most forms of Bright's disease, three stages can usually be differentiated

1 A latent stage in which the decrease in concentrating ability merely impinges on the large factor of safety of the kidney without repercussion on the organism as a whole

2 A stage of compensated impairment of renal function in which the decreased concentrating ability is atoned for by increase in urinary volume. There is no retention of potential urinary constituents and the only symptoms and signs are those due to the polyuria

3 A stage of decompensated impairment of renal function in which the volume of urine is not sufficient to make up for the decreased concentrating ability with resultant retention of potential urinary constituents. The resulting symptoms of uremia are due not only to the direct effects of the retained urinary constituents, the organism also suffers from dehydration and demineralization due partially to regulatory adjustments to maintain the constancy of the internal environment in the face of impaired renal function and partially to gastrointestinal disturbances

Impairment of renal function with consequent azotemia and uremia occurs in two great groups of cases

1 Renal azotemia, in which the impairment of renal function is due to structural changes in the kidneys, e.g., Bright's disease, polycystic kidneys, pyelonephritis, etc

2 Prerenal azotemia, in which the disturbance in renal function is due to causes not necessarily documented by structural alterations in the kidneys. Available evidence

indicates that the impairment of renal function is most often, if not always, due to diminution in the volume of blood flow through the kidneys, which results in diminution of both urinary volume and concentration. The decrease in renal blood flow is in turn the result, in at least most instances, of diminution in circulating blood volume. So to speak, the pre-renal azotemias constitute a chapter in the pathology of the circulation.

On the basis of clinical observations, and in the light of experiments indicating that urea clearance and renal blood flow are affected by the protein ration, it is pointed out that protein restriction has often been carried to disadvantageous degrees in the treatment of renal insufficiency.

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## AMENDMENT TO THE CONSTITUTION

Presented by DR. WILLIAM S. THOMAS at Stated Meeting, April 1, 1937

Approved by Council on April 28, 1937

Adopted November 4, 1937

### ARTICLE 3, SECTION 5

"After the words, 'other than medical', insert the following 'or must, in lieu thereof, possess qualifications which are approved by the Council'," the entire Section thus reading:

Section 5. A candidate for election as an Associate must be a graduate of at least five years' standing of a scientific institution other than medical, or must, in lieu thereof, possess qualifications which are approved by the Council, and be engaged in teaching in subjects allied to medicine or hold an official position in a health department, quarantine station or medical library in the United States.

## MEMBERS ELECTED

Raul Pietri	501 Grand Ave, Asbury Park, N J
Sidney Grossman	1112 Park Avenue
Milton Helpner	1391 Madison Avenue
Earle P Huff	141 Columbia Heights, Brooklyn
Emerson C Kelly	269 South Main Avenue, Albany, N Y
Herman H Lardaro	230 East 48 Street
Alfred Lihienfeld	121 East 60 Street
Walter D Ludlum, Jr	40 East 61 Street
Robert R M McLaughlin	40 East 61 Street
William B Rawls	430 East 86 Street
Aaron Bell	57 West 57 Street
Claude A Burrett	1 East 105 Street
Maurice J Costello	140 East 54 Street
William M Dick	77 Park Avenue
Ernest Kraft	33 East 61 Street
Samuel W Lambert, Jr	955 Lexington Avenue
Joseph S Lawrence	100 State Street, Albany
Allan J Roos	115 East 72 Street
Robert C Schleussner	131 East 91 Street
Henry P Schugt	30 East 40 Street
Zenas Horace Ellis	58 East 65 Street
Burdge Perine MacLean	Huntington, N Y
Hyman J Udinski	29 Passaic Avenue, Passaic, N J
Benzion Liber	611 West 158 Street
Sol Sidney Lichtman	395 Riverside Drive
John F Mahoney	U S Marine Hospital, Stapleton, S I
I Campbell Thompson	404 East 55 Street
Bard Williams	140 East 54 Street
Walter Hipp	140 East 54 Street
Robert Lee Patterson, Jr	135 East 65 Street
Ralph Eugene Swope	667 Madison Avenue
Edward Tolstoi	2 East 94 Street
Theodore P Wolfe	730 Park Avenue
Charles A Flood	420 Riverside Drive

# PROCEEDINGS OF ACADEMY MEETINGS

## NOVEMBER

### STATED MEETINGS

November 4

- I EXECUTIVE SESSION—a Reading of the Minutes b Election of Members c Report of Nominating Committee d Vote on Amendment to Constitution
- II PAPERS OF THE EVENING—(Tenth Annual Graduate Fortnight)—a Nature of hypertension Irvine H Page The Lilly Clinical Research Laboratory Indianapolis Ind b Clinical aspects of hypertension including malignant hypertension Herman O Mosenthal Professor of Clinical Medicine, New York Post Graduate Medical School Columbia University c Evaluation of the surgical treatment of hypertension George J Heuer Professor of Surgery Cornell University Medical College
- THE HARVEY SOCIETY (IN AFFILIATION WITH THE NEW YORK ACADEMY OF MEDICINE)

November 18

THE SECOND HARVEY LECTURE The Pasteur Meyerhof Reaction in Muscle Metabolism Einar Londsgaard Institute of Medical Physiology University of Copenhagen This lecture took the place of the second Stated Meeting of the Academy for November

### SECTION MEETINGS

The following Sections graciously consented to forego their regular meetings November 1 to 12 in favor of the Tenth Annual Graduate Fortnight Dermatology and Syphilology Surgery Neurology and Psychiatry Historical and Cultural Medicine Pediatrics

#### SECTION OF OPHTHALMOLOGY—November 15

- I INSTRUCTIONAL HOUR (7 00 to 8 00) Embryology, Brittain F Payne
- II SLIT LAMP DEMONSTRATION—Milton L Berliner Wendell L Hughes Girolamo Bonaccolto Gordon M Bruce
- III READING OF THE MINUTES (8 30)
- IV READING OF REPORT OF STANDARDS FOR OUT PATIENT OPHTHALMOLOGIC SERVICE—Conrad Berens
- V INSTRUMENTS DEMONSTRATED—A simplified gonioscopic outfit Isaac Hartshorne
- VI PRESENTATION OF CASES—a Microphthalmos with cyst formation Donald W Bogart (by invitation) b Coats disease Robert M Oliver (by invitation) c Conjunctivitis tularensis David H Webster d Sarcoma of eyelid Fritz Bloch (by invitation)
- VII PAPER OF THE EVENING—Choroidal sclerosis in coronary arteriosclerosis Martin Cohen Discussion James R Lisa Robert H Halsey

#### SECTION OF MEDICINE—November 16

- I READING OF THE MINUTES
- II PAPER OF THE EVENING—Recent clinical and experimental advances in cancer research with reference to heredity, biology and chemistry Francis Carter Wood
- III DISCUSSION—a Carcinogenic chemicals S Burt Wolbach Boston (by invitation) b Cell potencies and the relation of certain intracellular compounds to growth Stanley P Reimann Philadelphia (by invitation) c The importance of statistical analysis in medicine and experimental research Wilhelmina Dunning (by invitation)
- IV GENERAL DISCUSSION

## JOINT MEETING OF THE SECTION OF NEUROLOGY AND PSYCHIATRY AND NEW YORK

NEUROLOGICAL SOCIETY—November 16

- I PAPERS OF THE EVENING—*a* Mental changes in chorea minor Donald Shaskan (by invitation) Discussion Karl M Bowman (by invitation) S Bernard Wortis Israel Wechsler David Arbuse *b* Cerebral lesions due to vasomotor disturbances following brain trauma Max Helfand (by invitation) Discussion Charles Davison Armando Ferraro Lewis Stevenson Foster Kennedy Richard Brickner *c* Oxycephaly A new operation result A preliminary report Joseph E J King Discussion Foster Kennedy S Bernard Wortis Ira Cohen George Hyslop *d* Subdural hematoma acute and chronic with some remarks about treatment Abraham Kaplan Discussion Foster Kennedy Ira Cohen Joseph E King

## II EXECUTIVE SESSION

SECTION OF OTOLARYNGOLOGY—November 17

## I READING OF THE MINUTES

- II PAPER OF THE EVENING—Curable cases of meningitis Wells P Eagleton

- III DISCUSSION—*a* From the clinical standpoint Isidore Friesner Josephine B Neal James G Dwyer *b* From the pathological standpoint Joseph G Druss Andrew A Eggston

## IV GENERAL DISCUSSION

## V EXECUTIVE SESSION

SECTION OF GENITO URINARY SURGERY—November 17

The Section decided to forego its November meeting inasmuch as the whole of the second week of the Fortnight was given over to urologic subjects

## JOINT MEETING OF THE SECTION OF ORTHOPEDIC SURGERY AND THE PHILADELPHIA

ORTHOPEDIC CLUB—November 19

## I READING OF THE MINUTES

- II PRESENTATION OF CASES—*a* Fracture of the neck of the femur treated by the ambulatory method Samuel Kleinberg Max Rabinowitz (by invitation) *b* Osteochondroma of the epiphyseal plate of the knee joint Harry Finkelstein *c* Partial resection of the ischium for tuberculosis Henry Milch *d* Muscle angiomas diagnosed and treated by venography and injection I Tunick (by invitation) M Pomeranz (by invitation) *e* Milroy's disease Edgar Oppenheimer *f* Complete anterior dislocation of the cervical vertebrae with contusion of the spinal cord quadriplegia and recovery Donald E McKenna *g* Some observations on the embryology of the hip joint Paul C Colonna, D A DeSanto (by invitation) *h* Fascial transplant for paralysis of abdominal muscles Leo Mayer *i* Three cases from St Luke's Orthopedic Clinic to illustrate a simple exploratory incision of the knee joint Mather Cleveland David M Bosworth

- III PAPERS OF THE AFTERNOON—*a* An encircling fascial band operation for hallux valgus and splay foot Arthur Krida *b* Use of metal bone plates in orthopedic surgery M Beckett Howorth *c* Pre adolescent wedging round back treated by spine fusion operations End result study of sixty cases Leon Lantounis *d* A standard of anteroposterior alignment of the lumbosacral joint with deductions concerning development and displacement, Albert B Ferguson (by invitation) *e* Summary of results of 1935 epidemic of poliomyelitis, Charlton Wallace *f* Resume of eighty operative cases of internal derangement of the knee joint limited to damage to the semilunar cartilages William Hadden Irish

## IV GENERAL DISCUSSION

## V EXECUTIVE SESSION

SECTION OF OBSTETRICS AND GYNECOLOGY—November 23  
*From The Margaret Hague Maternity Hospital, Jersey City*

- I CASE REPORT—Aplastic anemia in a case of streptococcic puerperal sepsis treated with sulfanilamide James F Norton (by invitation) Nicholas M Alter (by invitation) Discussion Cornelius P Rhoads
- II PAPERS OF THE EVENING—a Roentgen diagnosis of placenta previa Milton A Carvalho (by invitation) John A McGeary (by invitation) Discussion Howard C Moloy b Efficiency of sodium lactate in raising carbon dioxide combining power Leon C Chesley<sup>1</sup> (by invitation) Felix W Vann (by invitation) Discussion Samuel A Cosgrove

AFFILIATED SOCIETIES

NEW YORK ROENTGEN SOCIETY—(IN AFFILIATION WITH THE NEW YORK ACADEMY OF MEDICINE)—November 15

- I PRESENTATION OF INTERESTING CASES
- II SUBTRACTION PLANIGRAPHY AND SERIESCOPY—B G Ziedses Des Plantes
- III EXECUTIVE SESSION

NEW YORK MEETING OF THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE  
 November 17

- I Differences in the spread of dye in the skin of normal and tuberculous guinea pigs A L Joyner (by invitation) F R Sabin
- II The application of vital dyes to the study of sheath cell origin S R Detwiler
- III Assay of thyrotropic hormone on day old chicks G K Smelser (Introduced by P E Smith)
- IV The effect of testosterone propionate upon the gonadotropic hormone excretion and vaginal smears of a human female castrate Udall J Salmon (Introduced by R T Frank)
- V Treatment of hepatomegaly in juvenile diabetes mellitus with a pancreatic extract Leo S Radwin (Introduced by B Kramer)
- VI The liver lipids and fecal excretion of fat and nitrogen in dogs with ligated pancreatic ducts Elaine P Ralli Saul H Rubin (by invitation) Clara H Present (by invitation)
- VII Serum phosphatase activity in generalized osteosclerosis Kaj Roholm (by invitation) Alexander B Gutman Ethel B Gutman (by invitation)

NEW YORK PATHOLOGICAL SOCIETY—(IN AFFILIATION WITH THE NEW YORK ACADEMY OF MEDICINE)—November 18

- I CASE REPORTS—a Actinomycosis of the ovary Lionel S Auster b Papilloma choroidaeum of the fourth ventricle Andrea Saccone Abraham Rosenthal c Large solitary cyst of the pineal gland Amour F Liber
- II PAPERS OF THE EVENING—a A study of the pharyngeal pituitary gland R H Melchionna (by invitation) b Pathological changes of the heart in sudden death James R Lisa
- III EXECUTIVE SESSION

## DEATHS OF FELLOWS OF THE ACADEMY

FERRIS, ALBERT WARREN, 111 North Walnut Street, East Orange, New Jersey born in Brooklyn, New York, December 3, 1856, died in East Orange, New Jersey, October 4, 1937, received from New York University the degrees of A B in 1878 and A M in 1885, graduated in medicine from the College of Physicians and Surgeons in 1882, elected a Fellow of the Academy January 15, 1891

Dr Ferris was president of the New York State Commission in Lunacy from 1907 to 1911 and Director of Saratoga Springs State Reservation Commission from 1913 to 1916. He was at one time Consulting Physician to Manhattan and Binghamton State Hospitals.

Dr Ferris was a member of the American Congress on Internal Medicine, the American Medical Association, the New York State Medical Society, and a Fellow of the American College of Physicians.

O'CONNOR, FRANCIS WILLIAM, 50 Haven Avenue, New York City born in Limerick, Ireland, May 13, 1884, died in New York City, October 3, 1937, graduated in medicine from St Bartholomew's Hospital and College, London, in 1907, and the Royal College of Physicians in 1913, elected a Non-Resident Fellow of the Academy November 6, 1930.

Early in his career Dr O'Connor made the study of tropical disease his specialty, spending several years in field and hospital research in South Africa. In 1913 Cambridge University awarded him the degree of Doctor of Tropical Medicine. He came to the United States in 1923 and for a time was associated with the Rockefeller Institute.

At the time of his death, Dr O'Connor was Associate Professor of Medicine at the College of Physicians and Surgeons and Associate Attending Physician to the Presbyterian Hospital.

Dr O'Connor was a member of the Royal College of Surgeons.

DOULEX, SINCLAIR, Garden City, New York born in Brooklyn, New York, December 19, 1864, died in Whitefield, New Hampshire, September 25, 1937, received the degrees of A B from the Polytechnic Institute of Brooklyn in 1884 and M A from Columbia University in 1885, graduated in medicine from the College of Physicians and Surgeons in 1888, elected a Fellow of the Academy April 4, 1895.



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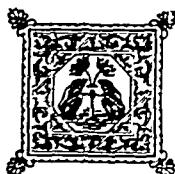
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